Australian Society for Limnology Inc.

NEWSLETTER

ASL Newsletter Volume 50 # 3
September 2012

ABN 54 606 483 226 ISSN 1037-2512

ASL Australian Society for Limnology

AUSTRALIAN SOCIETY FOR LIMNOLOGY INC.

The Australian Society for Limnology Inc. (ASL) is an Australian based scientific society whose focus is the study and management of inland waters. The ASL was established in 1961, and has a current membership of over 650 researchers, managers, engineers, teachers and tertiary level students from all states and territories. Members have a strong professional interest in inland aquatic issues, including the maintenance of biodiversity, the maintenance and/or restoration of water quality, and the wise use of aquatic resources. The Society also has a strong interest in fostering the scientific and intellectual development of tertiary students.

The Society includes members working in government agencies, tertiary institutions and many industries related to aquatic resources. Through their daily activities, members have contact with local communities and are in a sound position to interpret and advise on inland water issues. The Society has a substantial knowledge base, and has assumed a responsibility to ensure that this is available to those who manage inland waters.

Accordingly, the charter of the ASL is to further our understanding of Australia's inland waters and to promote their wise use and sustainable management. In this manner we will contribute to the continued existence of this valued resource and the maintenance and enhancement of the quality of life for all Australians. The ASL regularly produces a newsletter with notes on limnological activities, articles of interest, book reviews and announcements of upcoming events likely to be of interest to Members.

ASL Home Page
www.asl.org.au

Or on Facebook
http://www.facebook.com/groups/australiansocietyforlimnology

EXECUTIVE OFFICERS 2012

President
Assoc. Prof. Darren Ryder
Dept Ecosystem Management, University of New England, Armidale NSW 2351
Ph: + 61 2 6773 5226 Email: dryder2@pobox.une.edu.au

Vice-President
Prof Belinda Robson
School of Environmental Science
South Street campus, Murdoch University
90 South Street, Murdoch, Western Australia 6150
Ph: +61 8 9360 2417 Email: B.Robson@murdoch.edu.au

Immediate Past President
Dr Darren Baldwin
Senior Research Scientist, The Murray-Darling Freshwater Research Centre
PO Box 991, Wodonga VIC 3689
Ph: +61 2 6058 2322 E-mail:Darren.Baldwin@csiro.au

Secretary
Dr Richard Marchant
Museum Victoria, GPO Box 666E, Melbourne VIC 3001
Ph: +61 3 8341 7433 Email: rmarch@museum.vic.gov.au

Treasurer
Dr Rebecca Lester
School of Life and Environmental Sciences, Deakin University, Warrnambool, VIC 3280
Ph: +61 3 556 33330 Email: rebecca.lester@deakin.edu.au

Student representatives
Douglas Green
Biological Sciences, Flinders University, GPO Box 2100, Adelaide, SA 5001
Ph: +61 8 82013002 Email: douglas.green@flinders.edu.au

Teresa Mackintosh
Australian Centre for Biodiversity and School of Biological Sciences, Monash University, Clayton, VIC 3800.
Ph: +61 3 9905 5675 Email: Teresa.mackintosh@monash.edu

Laurisse Frampton
Australian Rivers Institute, Griffith University, Nathan campus, 170 Kessels Road Nathan QLD 4111
Ph: +61 7 3735 7402 Email: L.Frampton@griffith.edu.au

CONTENTS

(Editor's note – to go directly to any one of the sections, CTRL + click on the page number)

PRESIDENT's REPORT 5

EDITOR's REPORT 6

GENERAL ANNOUNCEMENTS 8

UPCOMING CONFERENCES 11

STUDENT ANNOUNCEMENTS 15

REGIONAL REPORTS 17

MINUTES FROM ASL EXECUTIVE TELECONFERENCE 20

VALE ALAN WEATHERLEY 22

SO YOU THINK YOU..... want to be a Bayesian modeller..... 24

FROM THE ARCHIVES.... Brian Timms..... 31

HIGH PROFILE LIMNOLOGY 33

REPORTS FROM THE TRENCHES 34

ASL EXPERTS..... 45

ASL SUBS 48

REGIONAL EXECUTIVE MEMBERS 2012..... 49

PRESIDENT's REPORT

As we approach the AGM at the 51st Congress in Armidale a number of issues and opportunities for the Society are emerging. The opportunity for ASL to represent the aquatic cluster at STA (formerly FASTS) has arisen and we are looking for a volunteer to join the ASL executive and represent ASL at biannual meetings. This is our chance to see if we can get positive outcomes for ASL from STA and help us decide if the Society remains a member. All enthusiastic responses will be gratefully received. Similarly, ASL recently contributed to a review of the Australian Academy of Science (AAS) on the structure of their National Committees and interactions with our Society. Our submission highlighted the current poor state of interactions and representation within the AAS, and proposed the establishment of an "Ecology" National Committee to better represent the members of both ASL and ESA. Finally, you will have received a final version of the ASL constitution via email. Changes to this require a vote at the AGM, and we have set aside time to work through this process to ensure the revisions best reflect the current practice of the Society.

In sad news for ASL, Alan Weatherley passed away recently. Alan was President in 1965, editor of the newsletter for many years, and a founding member of ASL, present at the 1961 meeting at ANU where he, Bill Williams, Hillary Jolly, Ian Bayly and others wrote the constitution and set ASL in motion. In 1967 Alan published a book 'Australian Inland Waters and their Fauna: Eleven Studies' and provided the impetus for ASL to continue in the early years. Alan left Australia in 1973 to become Professor of Fisheries Biology in Norway, then to Canada where he worked until retirement in 1993. On behalf of ASL, I would like to pass on our sympathies to Alan's family, and encourage everyone to hunt out an edition of his classic book that set the scene for early Australian limnology.

At the AGM last year I was asked a great question, 'What is the plan to increase ASL membership?' Thanks to the work of the Executive, I think ASL is in a sustainable position to continue to represent the interests of limnologists for the foreseeable future, with increased opportunities for the Society at a National level with active input to STA. State-based activities have emerged as an excellent basis for connecting existing members and attracting new members to the Society, with funding now explicitly allocated to these events. Recent successes of the Tasmania Symposium and ACT seminars, all our friends (over 100) on Facebook, and the new webpage that is being actively used for news, jobs and events all link to a positive future. All this reflective stuff can only mean one thing; this is my last blurb as President and I have survived the tenure. Thanks to everyone at ASL, and Jacqui and the crew at ASN for all the help. See you all at the Congress in November.

Darren Ryder

EDITOR's REPORT

Hello from the Editor's desk (and on behalf of my busy deputy editors). In a reprise from last edition THANK YOU for the many contributions to this issue. It's a bumper crop, I hope that you agree.

Thanks in particular to **Catherine Leigh** for putting together this edition's 'From the Archives' with **Brian Timms**, and for **Sarah Mika** for facilitating **Karlie MacDonald's** excellent contribution on Bayesian Modelling. We also have another new section this edition. With the growth of state-level events within ASL (led by Tasmania's example, it must be noted) there will now be a 'Regional Reports' section highlighting those activities. This edition we have contributions from Tasmania and ACT. I look forward to seeing other states' contributions....

Some great submissions to the 'Reports from the trenches...' section this issue, check them out to see what limnos are up to all over Australia (and New Zealand, thanks **Gerry Closs** for your contribution).

Darren mentions in his President's Report the passing of Alan Weatherley, a founding member of ASL. A short obituary for Alan can be found on page 22.

Really looking forward to the ASL Congress in Armidale. It's in a beautiful part of the world and it should be a really fun meeting. For students there are as usual opportunities for support from ASL. NZFSS and ES Australia meetings are in the week after ASL so you can compound your liver damage and pick one of those two to attend as well.

Ross

NEWSLETTER EDITOR:

Dr Ross Thompson

Australian Centre for Biodiversity and School of Biological Sciences
Monash University, Clayton, Melbourne VIC 3800
Phone: 03-9905-5633
E-mail: ross.thompson@monash.edu

DEPUTY EDITORS:

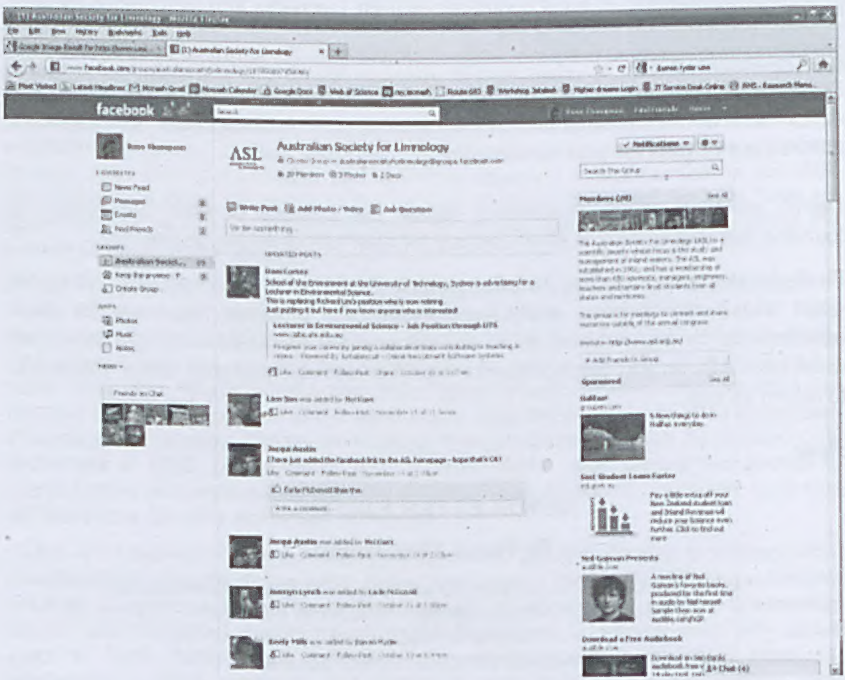
Dr Catherine Leigh
Australian Rivers Institute
Griffith University

Sarah Mika
School of Environmental & Rural Science
University of New England
Armidale, Australia

Keely Mills
Centre for Environmental Management
School of Science, Information Technology & Engineering (SITE)
University of Ballarat (Mt Helen)

The Australian Society of Limnology has a Facebook page!!

If you are on Facebook, then 'friend' us. If you aren't on Facebook, here is the incentive you have always needed to join.
Click here to go to Facebook now.



GENERAL ANNOUNCEMENTS

2013 Taxonomic Workshop

Aquatic Macroinvertebrates
La Trobe University, Albury-Wodonga Campus
Tuesday 5th and Wednesday 6th February 2013

Presented by the School of Life Sciences, Department of Environmental Management & Ecology

Program will include Crustaceans, Molluscs, Temnocephalans and Aquatic Dipterans.

Guest Speakers:

Mr John Dean
Dr Winston Ponder
Dr Kim Sewell
Dr Ros St Clair
Mr David Cartwright
Mr Chris Madden
Mr Michael Shackleton

Venue

The workshop will be held in room 6101, Main Lecture Theatre, La Trobe University, Albury-Wodonga Campus, University Drive, Wodonga VIC Australia 3690.

http://www.latrobe.edu.au/io/documents/maps/aw/aw-site.pdf

Details can be found at
http://www.latrobe.edu.au/environmental-management-and-ecology

Workshop costs

Course fee: $300 ($100 for full-time students) includes workshop, lunches, morning tea and afternoon tea.

Workshop dinner: Tuesday 5th February 2013 - $65

Contact and registration

1. For online registration please click here (http://webpay.latrobe.edu.au/onestop/tranform.cgi?TRAN-NO=829)

If you are unable to utilise a credit card to book your registration please contact Rachel Gorman.

Further information

For any further information please contact:

Ms Rachel Gorman
Phone (02) 60249885
E-mail: r.gorman@latrobe.edu.au

OLDIES BUT GOODIES: CLASS SETS AVAILABLE

Two guides for catchment managers are available from the eWater CRC archives.

Conserving Natural Rivers by Peter Cullen, and *Assessing River Condition Using Existing Data* by John Whittington, are the two parts of the 'River Management Series' published in 2002 by the CRC for Freshwater Ecology.

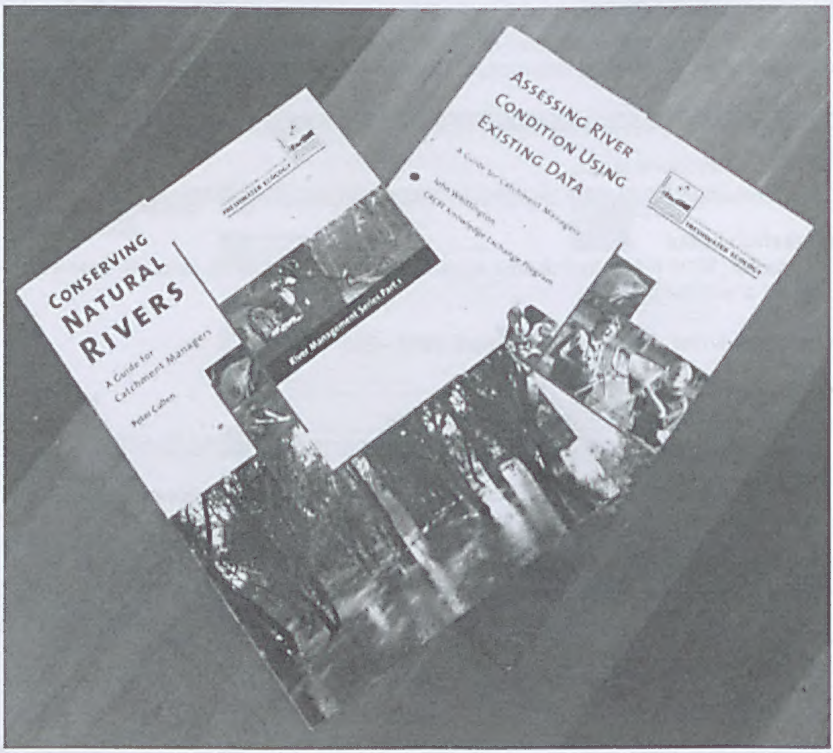
Conserving Natural Rivers discusses (obviously) the protection of natural rivers, including: why do it; threats and how to reduce them; decisions needed by catchment authorities; and how to tell if *your* local river is of regional or national value.

Assessing River Condition covers: why and how to assess river condition; considerations in compiling relevant data and in doing the assessment; and communication tips. As it points out:

> *A well communicated assessment of river condition provides the foundation for effective regional planning and management of rivers.*

These should be useful for teaching undergraduates, for example, quite apart from the value of having a copy or three on your shelf as a memento of those CRCFE days. Relatively large numbers of them are available, and it'll be 'first-in first-served'.

Please email contact@ewater.com.au, saying how many copies of each you want, and where to send them.


Conserving Natural Rivers
A Guide for Catchment Managers
Peter Cullen
River Management Series Part 1
Assessing River Condition Using Existing Data
A Guide for Catchment Managers
John Whittington
CRCFE Knowledge Exchange Program

Keep up to date on environmental water news

Water for the Environment News is available twice yearly from the Office of Environment and Heritage, NSW's environmental water manager. Each edition features stories on environmental water events and actions across New South Wales.

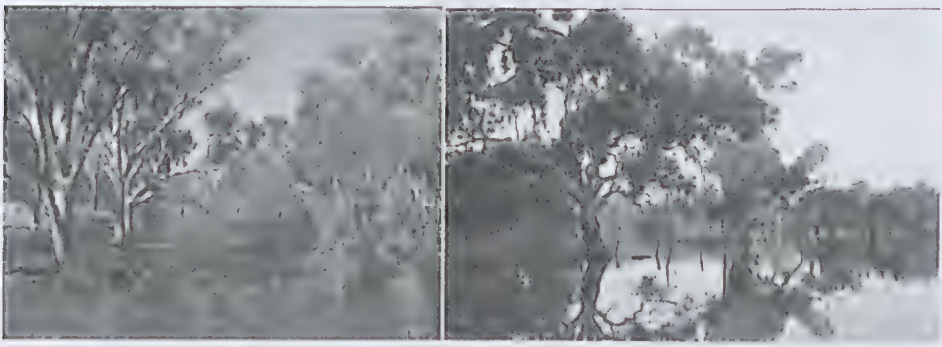
Read about:

- How wetlands and rivers are benefiting from environmental water
- Scientific studies and modelling on environmental water
- Partnerships between government, the community and other agencies
- Flora and fauna responses to flooding events
- Planned watering events
- Water policy
- Water purchased and recovered through NSW programs

The latest edition of the news is available online at:

www.environment.nsw.gov.au/environmentalwater/newsletters.htm

To subscribe to the newsletter, send 'Subscribe' to water.news@environment.nsw.gov.au



LEFT: Cochran Creek in May 2011 during a trial watering event. Photo: Emma Wilson/OEH

RIGHT: Dry Lake in June 2011 after 150GL of environmental water was released into the Murrumbidgee and Murray River systems. Photo: James Maguire/OEH

UPCOMING CONFERENCES

ASL Australian Society for Limnology

51st Congress
Armidale, NSW
26th - 29th November, 2012

The 51st Congress of the Australian Society for Limnology will be held from November 26th to 29th, 2012. The location is set amongst the rolling hills of the New England region in NSW, so beautiful in spring. The venue is the **University of New England in Armidale.**

The theme of the conference will be "Life at the edge: Boundaries, ecotones and links in freshwater ecosystems"

This theme was chosen as a rather tenuous link to the location of Armidale atop the great escarpment on the boundary between the Murray-Darling catchment and the eastward flowing coastal rivers, and also in reference to the critical role of our local independent member of the hung parliament.

Scientifically, boundaries are increasingly being shown to be important areas of productivity, diversity and process in river ecosystems.

The conference will be run over four days starting with the student workshops on Monday November 26th. These workshops will include a session on how to write a journal article and a media skills workshop.

Day 2 will open with a plenary session followed by contributed presentations.

The program for day 3 will feature the presentations by the ASL and Early Career Researcher Medalists as well as a first for ASL congresses – two 'power sessions' of 10 minute speed talks. These sessions are aimed at providing the opportunity for speakers to present the equivalent of rapid communications to a large audience – twice the people in half the time.

Mid conference excursion will showcase some of the local wetlands, rivers, wineries, waterfalls and, did I mention wineries?

The final day will begin with a morning of contributed sessions and the congress will close, as was the case last year, with an afternoon of themed plenary sessions, followed, of course by the congress dinner. The venue for the congress dinner is yet to be finalised, but we hope to have it at a local winery...

There will be plenty of budget accommodation available at the UNE colleges.

Early Bird registration is open until September 28th

Abstract submission for oral presentations is closed, but poster abstracts are still being accepted.

And don't forget the post-conference trip...What better way to end the 51st ASL congress than to experience the wild rivers of the NSW north coast? A 2-day canoe trip will centre on the Nymboida River in northern NSW and will provide a picturesque location for freshwater ecologists and budding canoeists. Don't forget to sign up as numbers are limited.

Watch for updates on the ASL website (www.asl.org.au) and on the ASL facebook site (http://www.facebook.com/groups/australiansocietyforlimnology/)

Enquiries can be directed to ASN Events (jm@asnevents.net.au) or the local organising committee.

We look forward to welcoming you to Armidale in November.

The local organising committee
Michael Reid (mreid24@une.edu.au)
Darren Ryder (darren.ryder@une.edu.au)
Mark Southwell (mark.southwell@une.edu.au)
Martin Thoms (martin.thoms@une.edu.au)
Matthew Tighe (mtighe2@une.edu.au)
Adrian Matheson (amathes3@une.edu.au)
Bruce Murray (bmurra20@une.edu.au)
Munique Reid (mwebb8@une.edu.au)
Murray Scown (mscown2@une.edu.au)
Rajesh Thapa (rthapa3@une.edu.au)

ASL members are warmly invited to attend the 2012 Annual Conference of the Ecological Society of Australia, which will be held at The Sebel, Albert Park in Melbourne, from 3-7 December. ESA2012 will bring together ecologists from academic, government and non-government backgrounds and will provide a valuable forum for researchers, land managers and policy makers to share advances in ecology and their implications for understanding our biosphere.

The conference theme "Ecology: Fundamental Science of the Biosphere" will "get back to basics" and focus on the scientific inquiry that underpins the discipline and the solution of environmental problems. Keynote speakers span a variety of ecosystems, including freshwater and marine, and the conference will be organised around concepts and processes rather than around habitats, ecosystems or organisms. The society is particularly keen to boost the numbers of presentations by aquatic researchers.

Visit www.esa2012.org.au for further details regarding the conference program, keynote speakers, and registration information, and we hope to see many of you there. Barbara Downes on behalf of the Local Organising Committee for ESA2012.

NEW ZEALAND FRESHWATER SCIENCES SOCIETY 2012 CONFERENCE

The 2012 Annual Conference of the New Zealand Freshwater Sciences Society will be held at the University of Otago in Dunedin from 3-7 December. The conference theme, 'Beyond the Limits', aims to provoke debate and discussion about the capacity of freshwater ecosystems in New Zealand and elsewhere to cope with current and future intensification of land use. Please see the conference webpage for details and contacts.

http://nzfssconference.co.nz/

STUDENT ANNOUNCEMENTS

$10 000 pa
Doctoral Scholarship Top-Up

Study with the Institute for Applied Ecology and you could be one of the best paid PhD students in Australia!

IAE Scholarship

The Institute for Applied Ecology (IAE) Doctoral Scholarship Top-Up is competitively awarded as a 'top-up' of up to $10 000 per annum for IAE PhD candidates who hold a stipend from any other source. This stipend could be from a University of Canberra scholarship, an employment scholarship or an international scholarship.

1st Class Honours Students – Pay special Attention!

If you received a 1st Class Honours award or equivalent from an Australian University, you may be eligible to receive an Australian Postgraduate Award scholarship from the University of Canberra (UC APA scholarship), worth $22 700pa, tax free. With this UC APA, and a relevant honours degree, you will be eligible to apply for the IAE Top-Up to receive up to $32 700 pa while you undertake your doctoral studies in Applied Ecology[1].

Other eligibility requirements

To be awarded the IAE scholarship top-up, all applicants need to be enrolled at the University of Canberra as a full-time doctoral student and have a project and a supervisor at the IAE[2].

About the IAE

The IAE is a research and teaching institute that produce work of international standing. IAE researchers hold distinctive strengths in basic and applied science, including in the following areas:

- Catchment systems
- Conservation biology
- Ecological health assessment
- Environmental chemistry
- Freshwater ecology
- Natural resource policy and planning
- Population modelling
- Sex determination and evolutionary biology
- Vegetation and wildlife management
- Wildlife genetics

[1] For more information on the UC APA, see: http://www.canberra.edu.au/research-students/scholarships/domestic-scholarships2

[2] For information about potential PhD projects, see: http://www.canberra.edu.au/centres/iae/potential-phd-projects.php

Contacts
Institute for Applied Ecology
University of Canberra, ACT, 2601, Australia
Phone: +61 (2) 6201 2795 Website: www.appliedecology.edu.au
Email: IAEAdmin@canberra.edu.au

UNIVERSITY OF CANBERRA

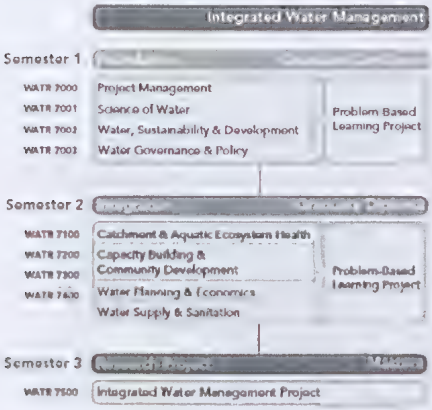
INTERNATIONAL WATERCENTRE

Master of Integrated Water Management

Graduate Certificate and Graduate Diploma
Full-time and part-time/distance

In the complex world of climate change and population growth, water professionals can no longer focus on a single aspect of water management. Solving water-related problems requires technical and scientific expertise and greater understanding and integration of environmental, social and political factors.

Program structure (Full-time)


Integrated Water Management
Semester 1
WATR 7000 Project Management
WATR 7001 Science of Water
WATR 7002 Water, Sustainability & Development
WATR 7003 Water Governance & Policy
Problem Based Learning Project
Semester 2
WATR 7100 Catchment & Aquatic Ecosystem Health
WATR 7200 Capacity Building & Community Development
WATR 7300 Water Planning & Economics
WATR 7400 Water Supply & Sanitation
Problem-Based Learning Project
Semester 3
WATR 7500 Integrated Water Management Project

For part-time/distance see www.watercentre.org/education/programs/part-time

Qualification from four leading universities

Students enrol at The University of Queensland (Brisbane). The program is managed by IWC and delivered by lecturers from all IWC member universities. Upon graduation students receive a co-badged qualification.

Griffith MONASH University

Three of our member universities are ranked in the top 100 universities of the world in the Times Higher Education World University Rankings.

Great incentives to enrol

- Field trips (Western Australia, Stradbroke Island and others) are included in the tuition fees.
- Masters and Diploma students receive $1,000 toward professional development.
- Masters students also receive up to $1,000 to support their third semester project.

Practical and applied components

The program builds on students' professional experience to approach water-related problems holistically

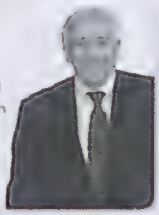
- **Lecture modules** teach knowledge and skills across a wide range of disciplines.
- **Team projects** allow students to apply their knowledge to real case studies in Australia and overseas.
- **Field visits** throughout Australia complement project work and give students first-hand water system experience and knowledge.
- **Network building** encourages students to establish links through the IWC's network of national and international specialists.
- **Skills development** allows students to gain practical skills to analyse and solve water-related problems.

Our graduates will acquire

- **Communication skills** across disciplines and sectors, and sciences and policy
- **Systems thinking skills** for the whole-of-water cycle
- **Collaboration skills** for cross-sectoral teamwork
- **Problem-solving skills** for complex issues requiring difficult tradeoffs
- **Risk assessment and planning skills** to devise sustainable solutions
- **Adaptive and reflexive learning skills**, i.e. an ability to learn by doing and applying context-specific solutions.

Paul Greenfield, AO
Vice-Chancellor
The University of Queensland

There are no courses in Australia, and very few internationally, that take such an integrated approach to teaching and learning about water management.



www.watercentre.org

REGIONAL REPORTS

TASMANIAN REPORT

Tasmanian ASL Forum a raging success!

The 2012 Tasmanian ASL Forum was held on 11 July in Hobart, Tasmania. This 1-day event was attended by 36 delegates, which were mostly Tasmanians, but had diverse backgrounds and included ASL members/non-members (the Forum generated about 10 new members!), and post-graduate and undergraduate students. The Forum had a similar format to a mini-conference (the Forum's program is available at: http://www.asl.org.au/asl-2012-tasmanian-forum/) with 13 presentations that mostly showcased limnological work in Tasmania.

The Forum got off to an indifferent start, with several delegates pitching in to re-arrange the seating plan to avoid the blinding sunshine of a clear winter's morning in Hobart totally washing out the projections of presentations! After having largely sorted out this issue, **Scott Hardie** welcomed delegates to an historic day in Tasmanian ASL history (I may as well talk it up). Then **Margaret Brock** officially opened the Forum with some of her thoughts on limnology in Tasmania and the value of using different types of events to enable ASL'ers to interact (i.e. national congresses, pub nights, etc.).

Two invited speakers (**Nick Bond** (Victoria) and **Russell Death** (New Zealand)) also participated in the Forum, and gave thought-provoking talks. **Regina Magierowski** and I (the Forum organisers) believe that the invited speakers were invaluable to the overall success of the event. They not only provided interesting talks, but enhanced discussions following talks, especially by providing a perspective from outside Tasmania. The invited speakers also enjoyed the opportunity to learn about what limnological work is being done in Tasmania, which may foster collaborations in the future; so there appeared to be benefits to both parties.

After the formal proceedings of the Forum (which were actually quite informal really) had been completed, drinks and nibbles at the Forum venue and an informal dinner (which was attended by 10 delegates) provided additional networking opportunities for delegates.

As per national ASL congresses, ASN Events assisted with administration of the Forum, including developing a website for the Forum, handling registrations and abstract submission via the website. Four local agencies provided financial sponsorship for the Forum, namely the Department of Primary Industries, Parks, Water and Environment, Entura, Hydro Tasmania, Inland Fisheries Service and University of Tasmania. Thanks to this support, and a good turn out by Tasmanian limnologists, the Forum basically covered its costs, with only $90 being required from ASL to balance the budget!

Verbal feedback and post-Forum survey responses indicate that delegates enjoyed the day and believed they got good value for money in attending the Forum. Delegates also rated the concept of a local Forum highly in comparison to pub nights and national congresses. Interestingly, the Forum reached a wider and more diverse

audience than most pub nights we have held in Tasmania, probably due to the daytime timeslot, multiple presenters covering a diverse range of topics, and the content of presentations by invited speakers. Importantly, the Forum provided another mechanism for Tasmanian ASL members to interact, with the value of networking opportunities that were associated with the Forum being highlighted by many delegates.

The experience of the 2012 Tasmanian ASL Forum shows that the concept of 1-day local event has merit. We'll be looking to hold other Forums in the future in Tasmania, possibly at annual or bi-annual frequencies. We think this style of event could also work well in other states/territories.

Finally, many thanks to the ASL Executive for supporting the Forum and to **Jacqui Moir** and the team at ASN events for their assistance (and excellent guidance) with administering the Forum.

Tas ASL pub nights

The 2012 Tasmanian pub series is still ticking away. The final pub night for the year is to be held on **September 3**. An overview of the 2012 pub nights will be provided in the next issue of the newsletter.

Scott Hardie

AUSTRALIAN CAPITAL TERRITORY REPORT

Pub Seminar Nights

University of Canberra

The ACT chapter of ASL has recently held two successful pub nights at Zierholz @ UC. **Trefor Reynoldson** from the University of Canberra spoke at the first pub night. Trefor spoke about comparing river condition assessment models using a common data set. The abstract from Trefor's talk is below:
Classification (cluster analysis) followed by Discriminant Function analysis (DFA) has been the standard approach used in RCA predictive models since the development of RIVPACS. At a workshop organized in 1999 there was discussion of the need to consider alternative modelling approaches but the conclusion at that time was that it was unwarranted. However, another decade has passed and a number of different approaches are now available. This talk reports the results of the analysis of a single data set using nine different modelling and assessment methods. These approaches include machine-learning methods (neural networks and Bayesian statistics) as well as more-traditional grouping and non-grouping strategies. The results from these new approaches have been compared to results from standard models developed using the AUSRIVAS/RIVPACS and CABIN modelling and assessment methods.

Chris Hepplewhite from ACTEW Water spoke at the second pub night on the implications of filling the new Cotter Reservoir. The abstract from his talk is below:
The new dam being built on the Cotter River in the Australian Capital Territory will greatly increase the capacity of an existing reservoir. The Cotter River and Reservoir provide critical habitat for several endangered species that may be affected by the filling of the reservoir which will inundate vegetation and soil releasing organic carbon into the water. Chris will present the work undertaken to assess changes in water quality and their effect on aquatic biota including the rate and magnitude of carbon release and their application to hydrodynamic models.

The ACT chapter also held a joint seminar with the Australian Society for Hydrology Chapter, where **Evan Harrison** presented a seminar on his Tantangara Dam environmental flow assessment research. Evan will be presenting some of these results at the Armidale Congress

Thanks to Zierholz @ UC for providing the venue and some great beer/wood fired pizza.
For information on the pub nights please contact Evan Harrison (Evan.Harrison@canberra.edu.au).

Photos from the pub nights can be viewed on the ASL facebook page.

The next pub night should hopefully be in late October for a joint event with the Australian Society for Fish Biology.

MINUTES FROM ASL EXECUTIVE TELECONFERENCE

ASL Executive Teleconference, 20 Aug 2012

Present: D. Ryder, D. Baldwin, B. Robson, R. Lester, S. Hardie, E. Harrison, B. Downes, G. Dunkerley, L. Frampton, S. Monk, J. Moir, R. Marchant

Apologies: T. Mackintosh, E. Turak, E. Garcia, J. O'Connor, K. Aldridge, S. Capon

1. Congress: Currently 47 abstracts have been received, but the deadline has been extended to Aug 24. Total number of registrations is 42. Both these are likely to increase substantially closer to the deadlines. Current sponsorship totals $19140; sponsorship negotiations are still in progress with the National Water Commission (Canberra). Three symposia have been suggested, each with 6 speakers. A post conference field trip is also being organised but will need 40 delegates to cover costs. ASL student representatives are involved in organising a pre-conference workshop and are investigating car-pooling for students driving to the congress.

2. Constitution: D. Baldwin has emailed the executive with proposed changes to the constitution. These changes have been based on responses from ASL members earlier this year. An aim of these revisions is to minimise codification of rules so that the constitution is reasonably flexible. D. Baldwin briefly summarised the sections which have been changed. D. Ryder and B. Robson will send out the suggested changes to all ASL members next week. The changes will be introduced one at a time at the next AGM and voted on. R. Marchant noted that the ASL records that he has custody of, as required by the constitution, have been placed in the Museum Victoria archive for safe keeping.

3. Reports from state representatives:
   Tasmania: S. Hardie was involved in organising a one day symposium in Hobart on July 11 at which 13 oral presentations were given. Two invited speakers (N. Bond and R. Death from NZ) also gave talks. Thirty six delegates attended and generally the audience was more diverse than that which has attended pub nights. ASN helped with the registrations and the general organisation. The event almost broke even; a deficit of $90 was recorded. Delegates felt that such one-day events had much merit and it is likely they will continue in Tasmania.
   ACT: E. Harrison ran a pub night last month in Canberra, attended by an audience of 23. Trevor Reynoldson was the speaker. Another pub night is scheduled for next week. He is trying to encourage local members of the Hydrological Society to attend and hopes to hold a joint event with members of the Australian Society for Fish Biology later this year.

4. Australian Academy of Science: the academy has been reviewing the functioning of its national committees. There is no committee covering ecological or freshwater matters. D. Ryder and the Ecological Society of

Australia have proposed to the academy that an Ecological Committee should be established.

5. STA: B. Robson has been in touch with the current head of the aquatic cluster in STA, who is a member of the Australian Marine Science Association (AMSA). AMSA is keen to hand over the reins to the ASL. D. Ryder called for someone from the executive to take on this position, despite the fact that ASL's commitment to STA has not been resolved. He felt that if an active member takes on this task then the society will be better able to gauge whether it is worth remaining a member of STA.

6. Other business: Gillian Dunkerley introduced herself as a replacement for E. Turak, the NSW representative, who is no longer able to continue in this position. She has taken over until the congress in November and is willing to stand for election for next year. She hopes to hold a short meeting of NSW members at the congress to establish what sorts of ASL events might be held in this state in the near future.

VALE ALAN WEATHERLEY

1928-2012

Alan Weatherley passed away on September 1, 2012 at Everett Chalmers Hospital in Fredericton, NB, Canada after a brief illness. He was born on March 28, 1928 in Sydney, Australia, and was a third generation Australian. In his childhood Sydney was already a city of a million and a half, but with its warm temperate climate, its airy spaces, the proximity of its great Harbour and splendid ocean beaches it provided a uniquely open environment. Like many boys of his time, Alan roamed the spacious park lands and hills of its eastern suburbs. He loved the outdoors and developed an early fascination with nature and with sports. His career as a zoologist began when he attended Sydney University, from which he graduated in 1949 with a BSc.

Alan then moved to Hobart to work in the CSIRO's Fisheries and Oceanography laboratory under the direction of Dr Aubrey Nicholls (who was the first President of ASL). This group were investigating the ecology of Tasmanian trout populations and aquaculture potential. Alan and Aubrey Nicholls carried out a major before-after experiment (1948-1952) (probably the first in Australian limnology) in which a lake (Lake Dobson) was fertilized and the responses in water quality, sediments, macrophytes, phyto- and zooplankton, benthos and trout growth were determined for the next 3 years. Subsequently, in 1959 Alan received his M.Sc. from the University of Tasmania with a thesis entitled "Tasmanian fish cultural studies" a study of the aquaculture potential of fish (trout, tench) in Tasmania.

From Tasmania, Alan in 1957 went to the University of Glasgow where in 1961 he was awarded his Ph.D. for his study of the thermal biology of perch (*Perca fluviatilis*) and the role of the interrenal tissue (source of corticoid hormones) in thermal stress. Knowledge of the thermal biology of perch provided a clear depiction of its invasion in Australia.

In 1961 Alan took up a lectureship in the new Department of Zoology at the Australian National University. He taught courses in vertebrate biology, comparative physiology and freshwater ecology. Shortly after his arrival he was requested by the National Capital Development Commission to investigate the chronic heavy metal pollution of the Molonglo River which flowed into the almost completed Lake Burley Griffin. This study documented the chemistry of the pollution (with Roy Beevers, Bureau of Mineral Resources) of the river and its toll on both fish and invertebrates (the latter with P.S. Lake) — pollution that still persists. From 1963 to 1966, Alan published 3 papers in "Nature" among others, and in 1965 he began drawing together reviews for the book "Australian Inland Waters and their Fauna: Eleven Studies" published by ANU Press in 1967. With John Lake (NSW Fisheries) he studied the distribution and ecology of introduced freshwater fish (published in the aforementioned book) and in 1972 with Tim Berra (Tulane University) the split between Murray cod and Trout cod was published. Simultaneously to this research, Alan was working away on his book "Growth and Ecology of Fish Populations", published by Academic Press in 1972. The book received the Publication Award of the Wildlife Society (USA) and became a Current Contents Citation Classic. During his time at ANU he moved from being a Lecturer to Reader in Zoology.

Alan was a co-founder in 1962 of the Australian Society for Limnology and was on the initial Committee and was elected the first Editor of the Newsletter. In 1965 he became the third President of ASL, (after John Lake) and was awarded the Society's Gold Medal. He was also Secretary of the Ecological Society of Australia and a member of the Executive Committee of the Great Barrier Reef Committee.

In late 1973 Alan moved to the University of Tromso, Norway (in the Arctic Circle) to become Professor of Fishery Biology. His charter was to develop a project to examine the feasibility of fisheries "based on fiord-inhabiting species to replace the formerly lucrative herring fishery that had been ruined by many years of overfishing against the strong advice of Norwegian fishery biologists". After a year and a half, Alan accepted the offer of a full professorship at the University of Toronto. The move was no doubt coloured by the strong influence on him of Professor Fry of Toronto University, who was a highly productive pioneer of fish ecophysiology, and who was then close to retirement. Alan established a research group working on fish growth, and metabolic activity. A major task was the successful development of telemetry to such a refined level that it was possible to monitor metabolic activity in free-living fish. From 1975 to his retirement in 1993, he and his colleagues (e.g. H.S. Gill, S.C. Rogers) published numerous papers and a book "The Biology of Fish Growth". Whilst in Toronto, Alan and his wife Robena Weatherley were active members of Science for Peace prior to his retirement in New Brunswick. From the early days in Canberra till recently he was involved in conservation problems as reflected in his first novel "The World That Is" (2002) and in the recent treatise "A Conservationist Perspective". Alan's second novel "Something Lovely" embraced another keen interest---aviation. He continued to work seriously in conservation with Robena, centred on the area where they lived in a picturesque setting alongside the Saint John River, New Brunswick. Alan and Robena were early members of Washademoak Environmentalists and later were co-founders of the Canaan-Washademoak Watershed Association. Alan was keenly interested in painting and during his retirement became a serious painter producing many evocative waterscapes among other scapes.

In all intellectual matters that interested him Alan maintained a critical and often sceptical approach and looked for strong, reliable evidence. During his life he was active in recreational sports, including cricket, tennis and squash, and remained very interested in participating as a spectator when unable to participate actively. His love of the outdoors, nature and scenery continued.

Alan Weatherley is survived by his wife Robena of Cambridge-Narrows, NB, his stepdaughter Lisa Jeffrey of Toronto (Robena's daughter) and his two children from his first marriage to Jacqueline Robin (Katherine of Canberra and Robert of Sydney, Australia) as well as his granddaughters Kylie of Canberra (Katherine's daughter) and Eleanor (Lisa's daughter).

SO YOU THINK YOU*...
want to be a Bayesian Modeller?

Karlie McDonald

kmcdonal@une.edu.au
School of Environmental and Rural Science,
University of New England, Armidale, NSW, Australia, 2351

The holy grail of ecology is to understand enough about how an ecosystem works to make skilful and gratifyingly accurate predictions about it. Management nirvana is that these ecological predictions are at temporal and spatial scales that are relevant and useful. Increasingly, ecologists are turning to complex modelling methodologies such as Bayesian statistics to produce statistically robust and ecologically relevant predictive models. But for those of us who studied through the golden age of traditional multivariate or frequentist univariate statistics, whose eyes glaze over whenever we hear "complex", "statistical" and "modelling" together in the same sentence, or who have or are considering committing to a (PhD) project that enthusiastically swoons over the benefits of Bayesian modelling: this is for you. Because the first question I am usually asked when discussing my PhD and its Bayesian modelling content (or more specifically, Bayesian belief networks – *stay with me*), is: what is it? And the truth is, when I agreed with my supervisors to use it in my PhD, I had only the smallest idea of what it entailed. So here's my extended answer in print and I hope it unravels the mysteries of Bayesian modelling at least enough to justify the dogged enthusiasm of those who pursue the challenging, cross-disciplinary integration of Bayesian modelling into their aquatic ecology research. So, take a deep breath and read on.

What is Bayesian Modelling?

Bayesian modelling comprises a range of statistical methods that implement methodologies developed from Bayes' theorem, the mathematical rules governing the propagation of probabilities based on the conditional dependency of variables as developed by Reverend Thomas Bayes (1702-1762) (Aalders 2008; Longmead et al 2009; Kininmonth et al 2010). There are a few key differences between frequentist statistics and Bayesian modelling techniques: Bayesian modelling (1) incorporates *a priori* information into the model; (2) uses this *a priori* information to weight data points according to their likelihood of occurring, creating *posterior* probabilities; and (3) the structure of the questions used to apply the hypotheses to the data differ (i.e. no null hypotheses) (McCarthy 2007). These features of Bayesian modelling are capable of producing integrative predictive outputs that have proved useful in aquatic research and management decision support including eutrophication in estuaries (Borsuk et al. 2004; Alameddine 2011), conservation of endangered species (Bosuk et al. 2006; Pollino et al. 2007), and the allocation and management of irrigation water (Hart et al. 2006; Adriaenssens 2004; Aguileria et al. 2010).

---

*This is the boringly repetitive reason for existence: we aim to promote issues and ideas that are pertinent for folk who are newish to being paid (even a pittance) to play in puddles. For it to achieve any meaningful anniversary, we need issues and ideas, preferably from early career folk. However, we also welcome feedback from the everlasting wise, especially where it relates to tips and tricks that would benefit us newbies.
I am grateful for Karlie's enthusiastic efforts to share her wisdom gained through the intense period she remained physically attached to mathematical modelling texts. If you have an idea for an article but want to canvass it with me informally first, I'll be at the ASL conference in November and I'm very nice to talk to. Or just email me: sarah.mika@une.edu.au .

The first step in an ecologist's metamorphosis into a Bayesian modeller is to research the theoretical principles and methodology. The key questions to answer are: (1) how are the data treated in Bayesian modelling, (2) when should the modelling framework be applied to datasets, and critically, (3) is it suitable for the dataset I will obtain from my research project? It is important to appreciate that this takes time: time to understand the theoretical principles, time to understand the actual modelling methodology, and time to determine whether it's a suitable analytical method for your project. I have fond memories of the intensive three-month bonding period between myself and Bayesian modelling in which I would wake up and go to bed with Bayesian modelling textbooks and journal articles. It took time and committed effort before I could confidently apply Bayes' theory to my project and integrate the model design into the ecological framework (theory and survey/experimental design). *Introduction to Bayesian Methods in Ecology* (McCarthy 2007) provides a solid, yet easy-to-read introduction into the fundamental theory and principles of Bayesian modelling that is required to critically understand published models and integrate the statistical technique into ecological practices and experimental designs.

At this point, your reading pile is likely to contain numerous Bayesian modelling papers covering multiple biomes, ecosystems and disciplines written by mathematicians and providing detailed accounts of varying degrees of difficulty of the mathematics of Bayesian techniques. However, many of these may well be too advanced and complicated to be useful to an ecologist interested in applying simple Bayesian networks and predictive modelling techniques. *Korb and Nicholson (2004)* provide a useful and thorough discussion of the mathematics of these simple Bayesian techniques. At the very least, these need to be understood and appreciated by anyone applying the statistical analyses.

While most Bayesian modellers and modelling papers promote the benefits of Bayesian modelling, traditional statistical analyses still have a role in most ecological research projects and the different analyses are not mutually exclusive: indeed the project may benefit by combining both traditional statistics and Bayesian modelling techniques (Mount and Stott 2008). My approach (and rather a good mantra) is: everything can be modelled but not everything should be modelled. *Stow et al. (2003)* outline the considerations that need to be addressed before applying Bayesian modelling. These include: (1) the environmental attributes to be assessed; (2) the data available; (3) the understanding of the system (causal relationships between variables and availability of *a priori* data); and (4) the identification of uncertainties. It is the thoroughness of your understanding of the theory and techniques in which you invest before designing and creating a model, that enables you to decide which statistical approach, or combination of approaches, is the most appropriate. Attempt to short-circuit this step and you risk basing your data analysis, interpretation and recommendations on inappropriate, clumsy and incorrect statistical models.

Bayesian Belief Networks

Bayesian Belief Networks (BBNs) are a recent, simple Bayesian modelling technique that is increasingly gaining favour as a statistical analytical technique for predictive and risk-based assessments (Carmona 2011). BBNs implement Bayesian methodologies in multivariate probability distributions, lack assumptions, and use conditional probabilities to define the causal relationships between variables in a model (McCarthy 2007; Aalders 2008; Ames et al. 2005). BBNs are a useful statistical method for predictive modelling of ecological datasets as they:

- quantify uncertainties associated with both the model output and the observed data providing a truly quantified risk assessment (Recklow 1994; Pollino et al. 2006);
- incorporate and compile qualitative and quantitative data from incomplete datasets, model simulations and expert opinions allowing for a large range of pre-existing data to be incorporated into the model (Barton 2008);
- can attain high spatial and temporal resolution from the incorporation of *a priori* information that is not limited to time- or site-specific datasets (Young et al. 2011);
- provide robust and powerful predictive analyses for uncertain, complex multifactor and dynamic multistate ecosystems, even with incomplete data (Henriksen et al. 2007);
- can be straight forward to create, update, modify and extend (Chan 2012; Shenton et al. 2011);
- are capable of assessing the outcomes of different management strategies in 'what if?' analyses (Tattari et al. 2003); and
- provide a graphical representation of causal relationships between variables in the model that can be heuristically valuable in stakeholder and science/management interactions (Chan 2010).

When applied within the correct experimental design and to appropriate datasets, these advantages of BBNs make them perfectly suited for modelling and predicting outputs in complex ecosystems (Gitelman and Herlihy 2007). Like many projects, my PhD research (*Developing nutrient thresholds and water quality guidelines for the NSW Northern Rivers: A Bayesian modelling approach*), required a combination of ecological field work and modelling to obtain missing data. This has improved the ecological relevance of the model through increased trans-disciplinary integration and provided a different discipline to work on when my sanity is challenged by numerous floods, vandalism, inexplicable theft (what smell-deprived cretin could possibly want to steal agar pots?), data points or case files.

Developing a BBN

After all that reading and wrestling with mathematical theory, it is undeniably exciting to start building your own model, at least until one realises how time consuming creating a Bayesian model can be. *And you thought you were over the time-consuming bit.* Each variable (or node) in the model must: (1) have defined causal relationships or probabilistic dependencies linking it to other variables in the network based on conditional probabilities (Carmona et al. 2011b), (2) have a specified distribution, either continuous or discrete (Ghabayen et al. 2006), (3) comprise a number of mutually exclusive states with multivariate probabilities (Haapasaari and Karjalainen 2010), (4) have one or more probability distributions associated with it proportional to the possible combinations of the variables located above it in the network (Langmead et al. 2009), and (5) link to a case file of *a priori* data points. Over 16 years of past monitoring data have been collated in my case files for each variable in the network. Developing and configuring each node in the network is an enjoyable, time-intensive task made more enjoyable by lousy weather and regular breaks involving joyous pets and just occasionally, fermented lubrication.

In the process of transferring the conceptual model of ecosystem variable interactions into the Bayesian model, you will come across *the Bayesian snowball effect*, the term I use to describe the point in time when you realise your model will actually be much bigger and more complicated than anticipated. It will happen more than once. My first encounter with it came when compiling rainfall data into case files

for water quality and water chemistry; these required correlations to be calculated to determine the rainfall over *x* days prior that influenced each sample taken at a particular time. Did I mention that my dataset comprises 16 years of data? This was closely followed by the need to add additional nodes. And repeat. This is a key point: published papers do not dwell on unsuccessful model versions, iterative developments that were made during model creation, or models that were tested and modified. This is an iterative process meaning that you'll do a lot of work that no one (other than your patient supervisors) will ever see. Ever. And yet that information is useful in developing the ecology modelling trans-discipline and for the creation of future models.

There are many Bayesian modelling software packages, varying in their friendliness towards users. They include packages such as WINBUGS, Analytica and Netica. It takes time to learn new statistical software applications, but I have found NETICA easy and (relatively) stress free, and good software support is available when needed. At this stage in the Bayesian modelling process, the three most important recommendations I can make are: (1) keep a log of progress when changing between the disciplines or stopping modelling for a period of time because re-finding endpoints can be difficult; (2) keep track of the locations and status of all files in metafiles; and (3) BACK UP EVERYTHING.

Trans-disciplinary Integration

By its nature, Bayesian modelling is trans-disciplinary, and may become a technique applied by modellers, mathematicians and ecologists without uniform aims and objectives or mutual understanding of each discipline. This can produce *project turbulence and train wrecks* (Boulton et al. 2008). Although this often occurs when multiple disciplines work on the same project, in Bayesian modelling, it is more commonly observed in trans-disciplinary peer review processes (i.e. papers, conferences). Commonly, trans-disciplinary debates over the approaches, research design (replicates, statistical power, *a priori* data) and model complexity (Bayesian Networks, Dynamic Bayesian Networks etc.) used in research projects occur due to differences (and lack of understanding) in the aims and objectives each discipline sets out to achieve.

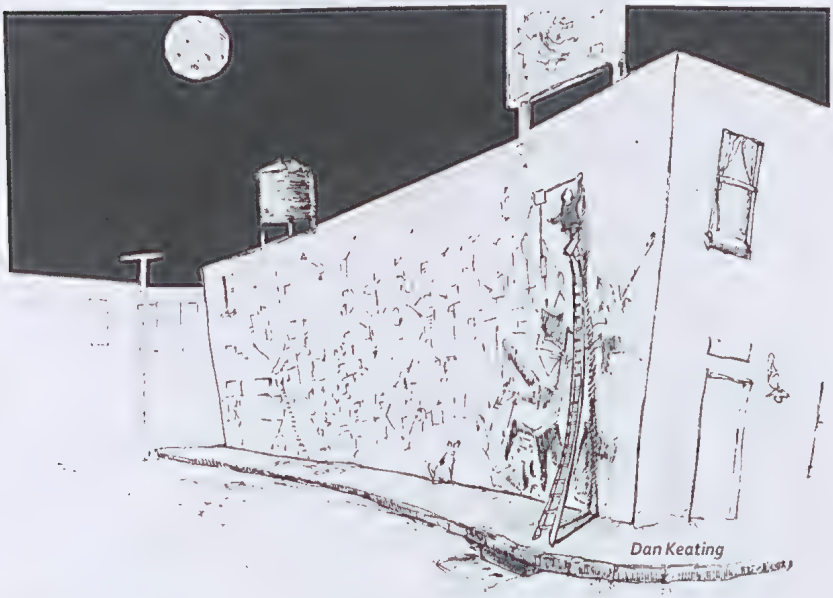
Bayesian modelling can assist in bridging the science/management trans-disciplinary interface as it is naturally suited to providing quantitative risk-based decision support for management strategies through integrating existing and new information and formally quantifying uncertainties (Pollino et al. 2006; Marcot et al. 2006). This provides exciting opportunities to directly imbed robust and rigorous scientific research into adaptive management strategies with beneficial outcomes for the environment. However, to avoid breakdowns in the trans-disciplinary science and management collaboration, the aims and desired endpoints of the model must be explicitly defined and supported by all parties prior to research and model development commencing (Ames et al. 2005).

Blatant advertising

A *Bayesian networking and predictive modelling* symposium will be held at the ASL annual conference in Armidale (26-29th November 2012). Bayesian modelling experts from iCAM, CSIRO, UQ and UNE will be presenting and discussing the statistical techniques and their catchment-based Bayesian research. Look for details in the conference program.

In a nutshell...

- Bayesian networks are a useful statistical analysis in many ecological research projects providing quantitative risk-based outputs with quantified uncertainties.
- Prior to commencing Bayesian modelling, it is important to understand the theory and principals governing its application and treatment of data.
- Combinations of traditional statistics and Bayesian techniques can be applied appropriately depending on the design and datasets.
- Bayesian networks are becoming an increasingly common analysis in environmental science to represent complex ecosystems with multiple factors. Although they are time-intensive to create, they directly link to adaptive management strategies and can simulate 'what if?' scenarios to inform management.
- Bayesian modelling is a rapidly progressing trans-disciplinary field, prone to the usual trans-disciplinary issues. Nonetheless, it promises opportunities for advancing both scientific research and environmental protection through developing integrated risk-based science/management approaches.



When whiteboards aren't enough: the Bayesian Snowball Effect

Acknowledgements

I would like to thank Sarah Mika and my supervisors Darren Ryder and Matt Tighe who provided helpful and insightful comments that improved an earlier version of this article.

You know you want to read more...

Aalders, I. (2008). Modeling Land-Use Decision Behavior with Bayesian Belief Networks. *Ecology and Society* **13(1)**: 16-16.

Adriaenssens, V., P. L. M. Goethals, et al. (2004). Application of Bayesian Belief Networks for the prediction of macroinvertebrate taxa in rivers. *Annales De Limnologie-International Journal of Limnology* **40**(3): 181-191.

Aguilera, P. A., A. Fernandez, et al. (2010). Hybrid Bayesian network classifiers: Application to species distribution models. *Environmental Modelling & Software* **25**(12): 1630-1639.

Alameddine, I., Y. Cha, et al. (2011). An evaluation of automated structure learning with Bayesian networks: An application to estuarine chlorophyll dynamics. *Environmental Modelling & Software* **26**(2): 163-172.

Ames, D. P., B. T. Neilson, et al. (2005). Using Bayesian networks to model watershed management decisions: an East Canyon Creek case study. *Journal of Hydroinformatics* **7**(4): 267-282.

Barton, D. N., T. Saloranta, et al. (2008). Bayesian belief networks as a meta-modelling tool in integrated river basin management - Pros and cons in evaluating nutrient abatement decisions under uncertainty in a Norwegian river basin. *Ecological Economics* **66(1)**: 91-104.

Boulton, A., H. Piegay et al. (2008) Turbulence and Train Wrecks: using knowledge strategies to enhance the application of integrative river science to effective river management, Chapter 3 in: River Futures: an integrative scientific approach to river repair. Editors: Brierley, G.B & K.A. Fryirs. Island Press, Washington.

Borsuk, M.E., C.A. Stow e al. (2004) A Bayesian network of eutrophication models for synthesis, prediction and uncertainty analysis, *Ecological Modelling* **173**, 219-239

Borsuk, M. E., P. Reichert, et al. (2006). Assessing the decline of brown trout (*Salmo trutta*) in Swiss rivers using a Bayesian probability network. *Ecological Modelling* **192**(1-2): 224-244.

Borsuk, M. E., C. A. Stow, et al. (2003). Integrated approach to total maximum daily load development for Neuse River Estuary using Bayesian probability network model (Neu-BERN). *Journal of Water Resources Planning and Management-Asce* **129**(4): 271-282.

Carmona, G., J. L. Molina, et al. (2011). Object-Oriented Bayesian Networks for Participatory Water Management: Two Case Studies in Spain. *Journal of Water Resources Planning and Management-Asce* **137**(4): 366-376.

Carmona, G., C. Varela-Ortega, et al. (2011). The Use of Participatory Object-Oriented Bayesian Networks and Agro-Economic Models for Groundwater Management in Spain. *Water Resources Management* **25**(5): 1509-1524.

Chan, T., H. Ross, et al. (2010). Participatory development of a Bayesian network model for catchment-based water resource management. *Water Resources Research* **46**: 7544-7544.

Chan, T. U., B. T. Hart, et al. (2012). Bayesian network models for environmental flow decision making in the Daly River, Northern Territory, Australia. *River Research and Applications* **28**(3): 283-301.

Ghabayen, S. M. S., M. McKee, et al. (2006). Ionic and isotopic ratios for identification of salinity sources and missing data in the Gaza aquifer. *Journal of Hydrology* **318**(1-4): 360-373.

Gitelman, A. I. and A. Herlihy (2007). Isomorphic chain graphs for modeling spatial dependence in ecological data. *Environmental and Ecological Statistics* **14**(1): 27-40.

Haapasaari, P. and T. P. Karjalainen (2010). Formalizing expert knowledge to compare alternative management plans: Sociological perspective to the future management of Baltic salmon stocks. *Marine Policy* **34**(3): 477-486.

Hart, B. T., M. Burgman, et al. (2006). Risk-based approaches to managing contaminants in catchments. *Human and Ecological Risk Assessment* **12(1)**: 66-73.

Henriksen, H. J., J. Kjaer, et al. (2007). Environmental benefits and social cost - an example of combining Bayesian networks and economic models for analysing pesticide management instruments. *Nordic Hydrology* **38**(4-5): 351-371.

Korb K.B., Nicholson A.E. 2004. Bayesian Artificial Intelligence. Chapman and Hall/CRC Press: London.

Kininmonth, S., M. J. H. van Oppen, et al. (2010). Determining the community structure of the coral Seriatopora hystrix from hydrodynamic and genetic networks. *Ecological Modelling* **221**(24): 2870-2880

Langmead, O., A. McQuatters-Gollop, et al. (2009). Recovery or decline of the northwestern Black Sea: A societal choice revealed by socio-ecological modelling. *Ecological Modelling* **220**(21): 2927-2939.

Marcot, B.G., Steventon, J.D. et al. (2006) Guidelines for developing and updating Bayesian belief networks applied to ecological modelling and conservation, *Canadian Journal of Forest Research* **36**: 3062- 3074.

McCarthy, M.A. (2007) Bayesian methods for Ecology, Cambridge University Press, New York.

Mount, N. and T. Stott (2008). A discrete Bayesian network to investigate suspended sediment concentrations in an Alpine proglacial zone. *Hydrological Processes* **22**(18): 3772-3784.

Pollino, C.A., Woodberry, O., Nicholson, A., Korb, K. & Hart, B. (2006) Parameterisation and evaluation of a Bayesian network for use in ecological risk assessment, *Environmental Modelling and Software* **xx**, 1-13

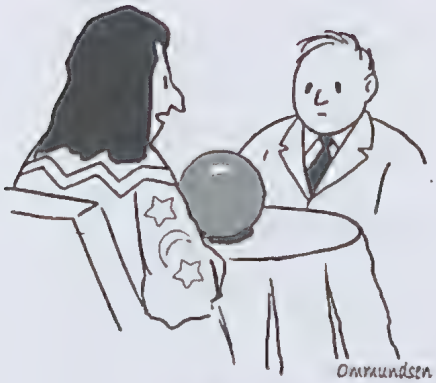
Reckhow, K.H. (1994) Water quality simulation modelling and uncertainty analysis for risk assessment and decision making, *Ecological Modelling* **72**, 1-20

Shenton, W., B. T. Hart, et al. (2011). Bayesian network models for environmental flow decision making: 1. Latrobe River Austalia. *River Research and Applications* **27**(3): 283-296.

Stow, C. A., C. Roessler, et al. (2003). Comparison of estuarine water quality models for total maximum daily load development in Neuse River Estuary. *Journal of Water Resources Planning and Management-Asce* **129**(4): 307-314.

Tattari, S., T. Schultz, et al. (2003). Use of belief network modelling to assess the impact of buffer zones on water protection and biodiversity. *Agriculture Ecosystems & Environment* **96**(1-3): 119-132.

Young, W. A., D. F. Millie, et al. (2011). Modeling net ecosystem metabolism with an artificial neural network and Bayesian belief network. *Environmental Modelling & Software* **26**(10): 1199-1210.



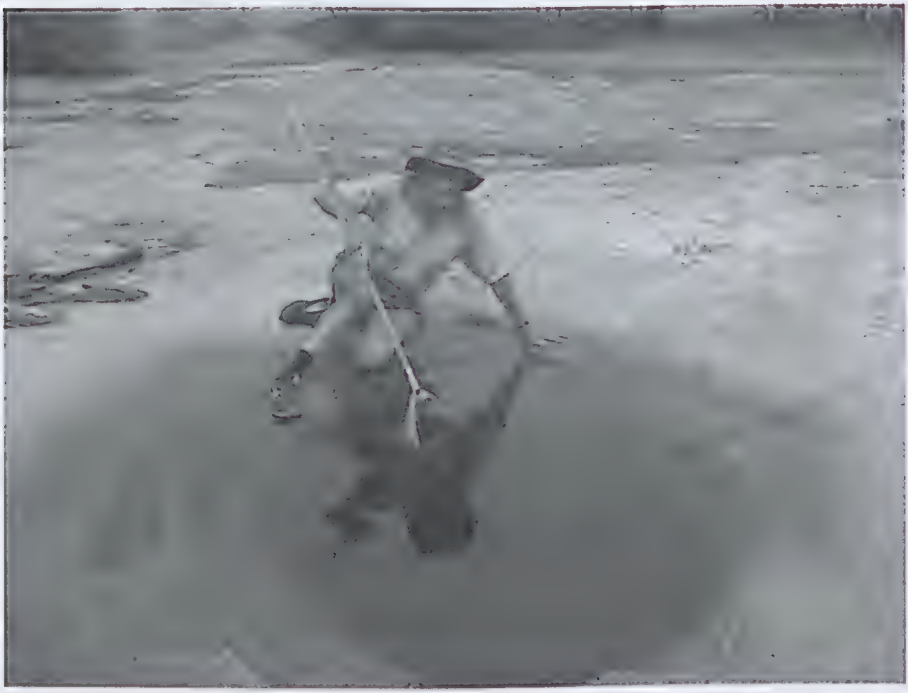
"Is this needed for a Bayesian analysis?"

FROM THE ARCHIVES...

Recollections and ruminations from long-standing ASL members:

snips, slips, quips and tips

This issue, we hear from Dr **Brian Timms**, retired but visiting professorial fellow, Australian Wetland and Rivers Centre, University of NSW, also research associate, Australian Museum, Sydney and visiting scientist, Bennelongia Consultants, Perth.



Brian demonstrates his current obsession with gnammas.

Year you first joined ASL: 1965 as an honours student, University of Qld with Ian Bayly as my supervisor.

First and most recent ASL conference you attended:

First: Warragamba Dam 1967

Most recent: Brisbane 2011

Snips (what floats your boat/ fires you up limnologically)?

I love field work in remote places—it satisfies my adventurous spirit, tones my 4WD skills and sharpens my innate geographic location abilities (I only use a GPS to record the coordinates, not to get there).

Slips (serendipitous moments or valuable lessons gained from unintentional bloopers/ accidents encountered over the course of your membership):

At Alice Springs conference in 2009 I was interviewed by the ABC about the change in fauna in the rock pools on Uluru. I wanted to say the gnamma pools had been adversely affected by people urinating and defaecating in and near pools, but the interviewer made me say 'peeing' and 'pooing' as she said Territorians wouldn't understand the terms I wanted to use. The interview went Australia wide and now the internet shows me up as an uneducated bumpkin!

Quips (earliest ASL-related memory that amuses and/or inspires you, or that you just can't shake):

In my early days I was Hilary Jolly's 'white haired boy'—she was very helpful to a budding planktonologist more or less isolated in northern NSW teaching high school. We were about the only members of ASL not living in Victoria, the then aquatic powerhouse of Australia. Trouble was when inebriated at conferences she couldn't even remember my name.

Tips (advice you have, of any sort, for newer ASL members):

Follow your dreams, work to your strengths, and don't worry about fads and bandwagons.

A call for contributors!

Are you a longstanding member of ASL? We'd love to hear your stories!

If you'd like to contribute to this section (or you think we could talk you into it), please email Cath (c.leigh@griffith.edu.au).

HIGH PROFILE LIMNOLOGY

This section will highlight high profile papers from limnology that have appeared over the last year and which have an ASL connection. Please feel free to nominate papers, books or reports for this section. Inclusion will be at the Editor's discretion. ED.

Rod Fensham is an Associate Professor at the University of Queensland, where he works extensively on a range of ecosystems, including artesian springs.

Biological Conservation 144 (2011) 2408–2417

Contents lists available at ScienceDirect

Biological Conservation

journal homepage: www.elsevier.com/locate/biocon

Four desert waters: Setting arid zone wetland conservation priorities through understanding patterns of endemism

R.J. Fensham [a,b,*], J.L. Silcock [b], A. Kerezsy [c,d], W. Ponder [e]

[a] Queensland Herbarium, Department of Environment and Resource Management, Mt. Coot-tha Road, Toowong, Qld 4066, Australia
[b] The Ecology Centre, School of Biological Sciences, University of Queensland, St. Lucia, Qld 4072, Australia
[c] Australian Rivers Institute, Griffith University, Qld 4111, Australia
[d] Bush Heritage Australia, Melbourne, Victoria 3004, Australia
[e] Australian Museum, 6 College Street, Sydney, NSW 2010, Australia

ARTICLE INFO

Article history:
Received 11 February 2011
Received in revised form 14 June 2011
Accepted 23 June 2011
Available online 6 August 2011

Keywords:
Arid zone
Conservation
Endemism
Wetlands

ABSTRACT

Long lasting surface waters in arid lands provide oases for aquatic biota but their values as biological refuges have rarely been assessed. This study identified and mapped permanent natural wetlands across the Eastern Lake Eyre Basin in Australia and classified them into four types: riverine waterholes, rockholes, discharge springs and mound springs. Waterholes are the most widespread and numerous source of lasting water, while springs and rockholes are confined to relatively discrete clusters. The characteristics of each wetland type are summarised, and their biological values compared by examining various scales of endemism for vascular plant, fish and endemic species. Discharge springs contain a near optimal concentration of endemic species across all three lifeforms at a range of scales. Waterholes are critical drought refugia for native fish species that also utilise a vast network of ephemeral streams during wet flooding. Rockholes and mound springs do not contain any known specialised endemics, although the latter have disjunct populations of some plants and fish. The existing knowledge of aridity, connectivity and habitat differentiation of the wetland types is compiled and their role in determining biological endemism is discussed. Exotic fish are a major conservation issue, the recovery of the Dalhatar springs should be paramount, and the intact network of permanent waterholes should be preserved. A focus on catchments, combined with an understanding of the biogeographical processes underlying the observed patterns provides an effective and systematic approach to setting priorities for regional biodiversity conservation.

© 2011 Elsevier Ltd. All rights reserved.

1. Introduction

The sharp contrast of permanent surface waters with the surrounding environment in arid-lands engenders assumptions about their biological importance. Desert wetlands encompass a range of hydrochemical, hydrophysical and morphological characteristics (Williams, 1999) that create many different habitat types for aquatic organisms. Biological diversity and endemism of wetlands has been assessed on a global scale (Junk, 2006; Abell et al., 2008; Balian et al., 2008) and regional studies have focused on single wetland types (Sorrie, 1994; Pinder et al., 2000; Fensham and Fairfax, 2003; Timms, 2007; Sarang et al., 2008) or taxonomic groups (Simovich, 1998; Kingsford et al., 1999; Ponder and Walker, 2003; Arthington et al., 2005; Balcombe et al., 2006; Brock et al., 2006; Ponder and Slatyer, 2007). These studies reveal that some desert wetlands exhibit local endemism, but more typically they support species with broad ranges, including fish across entire catchments and many plants with cosmopolitan distributions. With good quality survey data, biological diversity can be analysed in relation to habitat specialisation and endemism can be circumscribed, allowing for a rigorous assessment of the conservation significance of the various wetland habitats (Keddy and Sharp, 1994; Fensham and Price, 2004; Horwitz et al., 2009). Focussing conservation efforts on hotspots of biological endemism is judicious because these species often have small populations, are vulnerable to extinction (Gaston, 1998) and represent the efficient accumulation of species for reserve planning (Lamoreux et al., 2006).

Conservation priorities will be better informed by an understanding of ecosystem processes and biogeographic history. In general, wetlands tend to have low levels of endemism, because severe fluctuations in water levels during the Pleistocene and Holocene favour plants and animals that are mobile or readily dispersed (Junk, 2006; Horwitz et al., 2009). In particular, species occupying ephemeral wetlands must have dispersal capabilities and generally exhibit little genetic structure (Martens et al., 2006; Abell et al., 2009). However,

* Corresponding author at: Queensland Herbarium, Department of Environment and Resource Management, Mt. Coot-tha Road, Toowong, Qld 4066, Australia. Tel.: +61 (07) 3896 9547; fax: +61 (07) 3896 9624.
E-mail address: rod.fensham@derm.qld.gov.au (R.J. Fensham).

0006-3207/$ - see front matter © 2011 Elsevier Ltd. All rights reserved.

REPORTS FROM THE TRENCHES

(Ed: I hope CAPIM realises that there isn't some sort of prize for having the most logos)

CAPIM
MELBOURNE UNIVERSITY

There's been plenty of activity in Victoria since our last update. Firstly, a number of staff and students from RMIT University, Deakin University, University of Melbourne (CAPIM) and the Department of Primary Industries presented their research at SETAC Europe and SETAC AU conference in Berlin and Brisbane. All reports are that both conferences were excellent and stimulated much thought for new research ideas and applications. **Bryant Gagliardi** extended his Berlin trip to carry out an experiment examining the fate and transport of pesticides in streams in collaboration with the German Federal Environment Agency (UBA). Facilities at UBA include artificial streams, 100 m in length, in which we could simulate pesticide contamination events without fear of polluting the environment!

Rhianna Boyle has completed her Master's degree on the effects of sediment-bound synthetic pyrethroids on chironomid growth and emergence. Congratulations! CAPIM also has a new PhD student, **Lee Engelstad** who will be working with **Sara Long** and **Allyson O'Brien** amongst others to develop new tests with freshwater and estuarine invertebrates to measure mixture toxicity. **Patrick Bonney** began his masters with CAPIM this semester. He is investigating the effects of sedimentation on invertebrate communities and is supervised by **Vin Pettigrove** and **Claudette Kellar**.

Vin Pettigrove and **Graeme Allinson** have been racking up plenty of frequent flyer points with visits to international collaborator organisations in various places including Europe, Japan and China. They recently met with staff from the Institute of Applied Ecology, Chinese Academy of Sciences and are working on developing collaborative linkages. **Graeme and Mayumi Allinson** and **Kathryn Hassell** will also be heading to the upcoming SETAC Asia Pacific Conference in Kumamoto (Japan). Graeme and Mayumi are chairing a session: "passive sampling in environmental monitoring" and Kath will give a presentation on the preliminary findings from a collaborative project with scientists from Nagasaki University.

The group is busily writing reports and papers, finishing work before the new spring field season. A collaborative project with the EPA has been completed, examining the effects of potato farming and forestry land use activities on the aquatic macroinvertebrates. A number of manuscripts are ready for submission including urban pollution effects on aquatic fauna (**Claudette Kellar**), pollution effects on *Gambusia holbrooki* (**Jackie Myers**) and agricultural pollution effects on aquatic fauna (**Bryant Gagliardi**).

Claudette Kellar

AUSTRALIAN RIVERS INSTITUTE
GRIFFITH UNIVERSITY, QLD

Griffith UNIVERSITY
Australian Rivers Institute

I have been busy compiling the comings and goings of ARI which has not been easy because I have just returned from 5 weeks in France where my studies of limnology were restricted to a pleasant day spent canoeing along the Dordogne. But enough about me: Our director **Stuart Bunn** is globetrotting as usual. He's currently in China, first in Wuhan attending meetings, giving seminars and signing another MOU with a Chinese institution (with the Changjiang Water Resources Protection Institute). Then he's off to Zhengzhou to give a presentation at the 5th International Yellow River Forum. After that he's off to Vienna (meetings as part of the Global Water System Project [GWSP]). This is followed by attending (and giving a presentation) at the 15th International River Symposium in Melbourne, then giving a plenary presentation at the 15th International Symposium on River and Lake Environment in Zhangjiajie, China. Then finally, he's off to Buenos Aires for IPCC meetings (Intergovernmental Panel on Climate Change).

Rob Rolls spent five weeks in July-August in north-western Finland working with a team of postgrad students and researchers from the University of Helsinki. By using a latitudinal climate gradient, the team are testing possible ecological and evolutionary consequences of increased warming (leading to shortening periods of ice cover) in subarctic freshwater systems. **Virgilio Hermoso-Lopez** has just been awarded a Griffith University Postdoctoral and Research Fellowship. From 57 applications, only 10 were awarded, so well done to Virgilio.

Welcome to **Sol Brich**, Senior Research Assistant working with **Andrew Brookes** on his Bank Erosion Project. Sol comes to ARI after working on the Central Big Sioux River Watershed Project with South Dakota Association of Conservation Districts. Another newbie is **Fabio Iwashita**, Research Fellow (Spatial Modeller) working with Andrew and Sol on the Bank Erosion Project. Fabio was awarded his PhD in Geosciences from Campinas University in Sao Paulo, Brazil and more recently has had a Postdoc. appointment with the Division of Earth and Ecosystem Sciences, Desert Research Institute in Reno, Nevada. Greetings to **Rashedul Mondol**, he joined the Hughes lab this year to undertake his landscape genetics PhD research on three freshwater fishes from the River Daly in northern Australia.

You may remember **Simone Langhans** from the ASL Brisbane conference last year. Simone, a Visiting Post Doc Fellow, funded by the Swiss National Science Foundation, left us in August after spending 12 months at ARI. Simone will now continue her fellowship in Berlin. As Simone is a keen surfer, we wonder if she'll be able to stay away from Australia for too long. Also, **Jan Benjamin**, who works for **Jon Olley** and the CSIRO Cluster, has decided to retire at the end of June. Jan's position will be filled by **Kathleen Gorris**. Congratulations to **Johann Gustafson** and **Jonas Mortensen,** supervised by **Joe Lee** on the Gold Coast campus, have both completed their MPhil. Johann's thesis was on the role of remnant patches of seagrass in providing physical flow refuges to small nekton while Jonas Mortensen built a hydrodynamic and an agent-based model for utilisation of Tallebudgera Creek by juvenile bull sharks.

Congratulations to **Jodie Haig**, who finished her PhD in 2010 (supervised by **Jane Hughes** and **Rod Connolly**). Jodie is leaving Australia as she has been awarded a

Postdoc. fellowship in Bangor in north-west Wales in the field of crustaceans. Jodie, like most Queenslanders, is used to shunning waders because of the heat: I daresay that things will be a little different in Bangor. Also, congratulations to **Michael Newham** who finished his PhD in 2011 (supervised by **Fran Sheldon** and Stuart Bunn). All it took was one skype interview and Michael landed a job as a Postdoctoral Fellow in Germany, conducting research in the North Sea. Michael's PhD research focused on denitrification in Australian riparian soils and now he is working on denitrification in sediments of the oceans and rivers of Europe. Michael says that "The shift from soil to ocean has been an interesting and challenging change in the focus of my research. It has abated any worries that I had about being pigeon-holed by my previous research and has made me realise that my research experience with ARI really can take me anywhere".

Other news: The ARI HDR Symposium was held on 25th July. Held each year this is an opportunity for all ARI HDR students to present their research to the centre. The keynote speaker this year was Dr **Ross Thompson** from Monash University. Ross helped to decide the winners of this year's prizes. The winner of the prize for the 3-minute talk was **Sofie Bernays** who was recently confirmed in her research on *Hypsilurus boydii* (Boyd's Forest Dragon). The winner of first prize and The Christy Fellows Memorial Trophy for best 15 minute presentation was **Paul Maxwell**, Paul's talk was entitled "Applying ecological resilience theory: modelling and testing the feedback loops to predict shifts in seagrass ecosystems". The wide range of research undertaken by ARI students just goes to show how the diverse the institute really is.

Our institute website: www.rivers.edu.au has recently been revamped. To follow our research plus associated staff/students visit the *research themes* section.

Angela Arthington has just released her new book "*Environmental Flows: Saving Rivers in the Third Millennium*". *Environmental Flows* describes the timing, quality, and quantity of water flows required to sustain freshwater and estuarine ecosystems and the human well-being and livelihoods that depend upon them. It answers crucial questions about the flow of water within and between different kinds of ecosystems. What happens when the flow or the availability of water is curtailed or diverted, either naturally or by human activity? How will climate change alter the availability of water and impact aquatic ecosystems? Methodological developments from the simplest hydrological formulas to large-scale frameworks that inform water management make this book a must-read for water managers and freshwater and estuarine ecologists contending with ever-changing conditions influencing the flow of water.

Environmental Flows is available from Inbooks. Contact Inbooks to order your copy before 30th September for the special price of $80.00 (+$7.70 postage). Tel: 02 8988 5082, email: orders@inbooks.com.au

Charlotte Hurry

(ED: Charlotte appears to have missed an important bit of Griffith news – CONGRATULATIONS to ***Charlotte Hurry*** *on her recent marriage in France. Well done. Now no more excuses, back to that thesis ... (I was her Hons supervisor, I'm still allowed to say stuff like that....))*

MURDOCH UNIVERSITY
AQUATIC ECOLOGY GROUP, WA

Belinda Robson and **Ed Chester** have been working hard on their NCCARF project. They have been surveying urban refuges in the Perth metropolitan area. With study sites consisting of drains, ditches and sumps, while trying to find a decent vanilla slice. They have been completing experiments on invertebrate survival where Ed has been nursing some invertebrates to a comfortable, dignified death under different drying regimes. **Scott Strachan** has been working hard looking at the 'drying and life history traits of invertebrates in metropolitan Perth wetlands'. He has collected a lot of invertebrates and has been sorting and experimenting with them, and currently preparing his first paper for submission.

Jane Chambers and **Gaia Nugent** have also been working on their NCCARF project in a multidisciplinary team developing a risk assessment and decision-making tool for managing groundwater dependent wetlands and caves with declining water levels due to climate change and other stressors. A key element of this research is to determine the habitat requirements (the hydrological and water quality conditions under which biota will persist) of biota. This will enable the future distribution of these habitats to be mapped based on groundwater levels under different climate change or anthropogenic extraction scenarios.

Peter O'Toole is currently assessing the effectiveness of riparian vegetation in removing nutrients in flat sandy stream systems. This project is funded by a 'Caring for Our Country' grant through the Swan River Trust. He is currently spending a lot of time looking down piezometers. **Caitlin Bartholomaeus** is studying the urban ecology of the Oblong Turtles in metropolitan Perth using GIS methods, social aspects and traditional ecology. She is between trapping seasons at the moment and has been working hard on ascertaining the public's perception of turtles in wetlands through questionnaires. **Robyn Paice** has been searching for aquatic macrophytes in the South-West Cape region, to see how important macrophytes are for river ecology and whether they can be used as an effective tool for restoration. **Kirsi Kauhanen** is working in partnership with the Water Corporation. Her work involves experiments manipulating nutrient concentrations in constructed wetlands to examine the effects on aquatic plant communities and phytoplankton. **Stacey Chillcott** is looking at ground water in some of the Margret River cave system. **Kerrylyn Johnston** has just joined the group as MAFRL Research Fellow, where she intends to continue her Australian freshwater research. She has returned to Australia from the University of Leeds in the UK where she completed a Postdoc. on the effects of prescribed moorland burning on upland streams. Everyone at Murdoch is looking forward to attending the ASL conference. See you all there!

Scott Strachan

DEPARTMENT OF ZOOLOGY
UNIVERSITY OF OTAGO
DUNEDIN, NZ

Planning is well advanced for the Annual Conference of the NZ Freshwater Sciences Society, to be held from 3-7 Dec at the University of Otago. The conference theme, 'Beyond the Limits' is sure to generate some spirited discussion. The first day of the conference comprises a series of plenary talks by David Dudgeon (University of Hong Kong), Mike Joy (Massey University), Alastair Bisley (Land & Water Forum) & David O'Connell (Ngai Tahu). The conference dinner dress theme is also 'Beyond the Limits'.....over to you!

Apart from conference planning there has been plenty of aquatic activity at the University of Otago. **Gerry Closs**, **Abbas Akbaripasand, Michael Greer** and **Lan Pham** travelled to Portugal for the Ecology and Conservation of Freshwater Fish conference in May/June. They can all happily report that the conference was extremely interesting, and the scenery, wine and food were superb. With temperatures up to the high 30's, the conference also provided a very enjoyable break from a Dunedin winter. **Christoph Matthaei** and **Katha Lange** also managed to experience some real Northern hemisphere summer heat by attending the Freshwater Science Society (formerly NABS) meeting in Louisville, Kentucky, in late May (a stimulating conference, the city maybe less so, but its inhabitants were friendly and an impressive river runs through it). Christoph then went on to present findings of recent multiple stressors research done by the Otago Stream Team to audiences at two research institutes in Germany. A winter escape wasn't on the cards for **Sourav Paul**, who travelled to Hobart for the combined Australian and NZ Marine Sciences Conference to present his work on the bioenergetics of estuarine mysids.

So to real work – When not involved with conference planning, **Gerry Closs** and **Charlyne Ribeyrolles** have been investigating whether avoidance of hypoxia is a possible reason for terrestrial spawning in inanga. In short, it isn't – the eggs of inanga can survive severe hypoxia for hours on end with no adverse effects. Gerry is also co-editing a book with **Marty Krkosek** and **Julian Olden** on the 'Conservation of Freshwater Fish', to be published by Cambridge University Press. **Christoph Matthaei** has started a new multiple stressors research project investigating the off-farm effects of the nitrification inhibitor DCD on running water ecosystems. This project involves PhD student **Romana Salis**, Honours student **Katie Blakemore** and collaborations with **Tina Summerfield** in the Botany Department at Otago, an environmental chemist at Mississippi State University and two ecological geneticists at the University of Bochum, Germany. In their role as graduate student supervisors, last August both Gerry and Christoph were surprised and honoured to receive "Top 14 Supervisors 2011" awards from the Otago University Students' Association, and Christoph also received the "Supervisor of the Year Award (Division of Sciences)". **Colin Townsend** continues to publish papers with colleagues and students on topics related to the effects of land-use change, multiple stressors and climate change on stream ecosystems.

The PhD students have been very active. **Abbas Akbaripasand's** PhD on the energetics of banded kokopu has been submitted and received favourable reviews from the examiners – final revisions are in progress. Congratulations! **Jeff Vanderpham** has also submitted his thesis on the morphology of the mechanosensory system in common and redfin bullies, and is busily working on

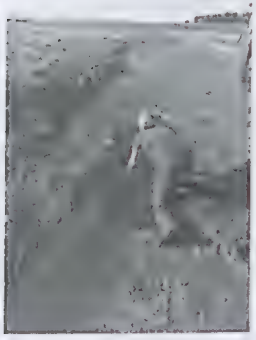
papers whilst awaiting his examiners' reports. **Vanessa Hammond** continues to work away on her PhD thesis on didymo – her work further confirms the link between hydrological stability, regulated rivers and didymo blooms. **Rasmus Gabrielsson** is working through the results of Chinook salmon and trout recruitment and migration data – a particularly interesting result being strong evidence for the downstream migration of salmon smolts from Lake Hawea through the Dunstan and Roxburgh dams supporting the Clutha river salmon run. **Doug Jones** is currently writing up the results of his experiment on brown trout migration and food supply, completed in Sweden in collaboration with **Larry Greenberg** (Karlestad University). **Aurelien Vivanços** is currently working with **Cédric Tentelier** and **Agnes Bardonnet** (UMR Ecobiop) in France on an experiment examining the effects of changing density on the stability of social hierarchies in juvenile brown trout. **Manna Warburton's** work on torrentfish progresses steadily; samples for a detailed study of population structure using genetics and otolith microchemistry have been collected, and the analysis is about to start. **Javad Ramezani** has completed an epic reach-scale experiment examining the effects of silt addition or removal from farmland streams on trout and other fish – the results suggest that trout and particularly eels like streams without lots of deposited fine sediment. He's also started writing up his PhD, with a first manuscript due to be submitted soon. **Lance Dorsey** has been working on brook charr in the Otago uplands – results suggest the populations of this introduced fish are probably in a pattern of long-term decline. Work is in progress on their bioenergetics and possible impacts on galaxiids. **Peter Jones** has completed one season of sampling eggs and larvae of non-diadromous galaxiids, with results indicating clear differences in the early life histories of these fish. **Michael Greer's** results on the management of agricultural drains suggest that partial macrophyte clearance may actually benefit giant kokopu, although total clearing is severely detrimental. **Sourav Paul's** work on the bioenergetics of estuarine mysids suggests that osmoregulation is extremely difficult at low temperatures, and this may explain the significant decline in the abundance of estuarine mysids in winter. **Tanya Dann** has just commenced a PhD on the life histories of damselflies on the South Island, examining the relationship between altitude, life history and the distribution of *Austrolestes* and *Xanthocnemis*.

Francis Magbanua completed his PhD in early 2012 (on the combined impacts of the pesticide glyphosate and deposited fine sediment on stream communities) and is now working as a Senior Lecturer at the University of the Philippines in Diliman, Philippines. In short, Francis's PhD research shows that, at least when used at the concentrations within the environmental exposure limit in NZ, glyphosate has less serious effects on ecological stream health (assessed by studying benthic invertebrates, algae and organic matter decomposition) than fine sediment. **Jeremy 'Jay' Piggott** has been working furiously this past year writing up his PhD work investigating the interactive effects of multiple stressors related to land use and climate change on stream communities. He intends to submit his thesis soon, and a first publication based on his PhD work is currently in revision. In July 2012, Jay started a research fellowship with the Association of Pacific Rim Universities (based at the National University of Singapore) where he is working to leverage multi-lateral research from the top 42 research universities across the Asia-Pacific into the regional public policy space around sustainability and climate change. In 2011/12, **Katha Lange** won a 6-month "IGB Fellowship in Freshwater Science" at the Leibniz-Institute of Freshwater Ecology and Inland Fisheries (IGB) in Berlin, Germany. During this period she deferred from her PhD to work on ecological models predicting the distribution of benthic invertebrates in lowland river meanders. She then presented the findings from this research project at the 2012 SFS meeting in Kentucky, funded by a travel grant from the IGB. Katha is currently conducting a one-year survey of multiple stream sites in the Manuherikia River catchment, during which she hopes to

disentangle responses of benthic organisms among the gradients of nutrient enrichment, fine sediment inputs and increased water temperatures due to water abstraction for irrigation. She also prepared a report for the Clutha Fisheries trust based on a collaborative study with Fish & Game Otago investigating land use effects on brown trout in the Manuherikia catchment. **Antje Bierschenk** finished her lab work last year and started writing her PhD thesis. Her first journal article, a study of the impacts of catchment land use on ecosystem functioning along a freshwater-marine continuum, was published this year. Last but not least, **Pourya Shahpoury**, a Chemistry PhD student at Otago co-supervised by environmental chemist **Kimberly Hageman** and Christoph Matthaei, is also close to submitting his thesis that investigated various pesticides and other contaminants in aquatic ecosystems. Pourya's thesis contains chapters focusing on ecological questions and others focusing on improving and/or developing sophisticated methods for detecting these contaminants. One of his key findings is that, while bed sediments in streams draining organic sheep/beef farms across the South Island contained lower concentrations of current-use pesticides than their conventionally farmed counterparts, the sediment in both stream types still showed detectable, and similar, concentrations of the residues of pesticides such as DDT that were banned in NZ almost 40 years before Pourya conducted his study.

The Masters students have also been slogging away. **James Shelley** gained a distinction for his MSc on the effects of water abstraction on stream communities in central Otago. The Otago winter chill obviously scared him away as he's now working on fish in the tropical Kimberly region of Western Australia – well done James! **Lan Pham** has completed working though invertebrate samples collected from the Zeelandia - Karori Sanctuary following the eradication of trout using rotenone – an initial look over of the data suggest relatively rapid recovery of the invertebrate communities following the rotenone release. **Rowan Moore** has completed his first sampling effort examining relationships between food abundance and redfin bully microdistribution. **Josh Tabak** is examining the impact of culverts on the distribution of fish in Otago coastal streams, and **Jon MacCallum** is designing a study aimed at examining the spatial ecology of didymo in large rivers.

Finally, **Greg Stanley** (BSc Hons) completed his research into the ability of the riparian plants *Phormium tenax* and *Carex secta* to filter excess nutrients from four levels of dairy farm leachate in June 2011. He found that plants showed a positive growth response to all four leachate concentrations, removing up to 41% of total nitrogen and 35% total phosphorus in the leachate at the highest concentration. The project is currently being written up for publication, and Greg is now working full time in an ecological restoration team in Christchurch.



Sampling a farmland stream affected by high levels of deposited fine sediment in the Manuherikia River catchment in Central Otago (PhD Katha Lange).

Publications

2012 *(including articles in press)*

Bierschenk, A.M., Savage, C., Townsend, C.R. & Matthaei, C.D. (2012) Intensity of land use in the catchment influences river ecosystem functioning along a freshwater-to-marine continuum. Ecosystems 15: 637–651.

Greer, M.J.C., Closs, G.P., Crow, S.K., and Hicks, A.S. 2012. Complete versus partial macrophyte removal: The impacts of two drain management strategies on freshwater fish in lowland New Zealand streams. *Ecology of Freshwater Fish:* Article in Press.

Herrmann P.B., Townsend C.R. & Matthaei C.D. (2012) Individual and combined effects of fish predation and bed disturbance on stream benthic communities: a streamside channel experiment. Freshwater Biology, in press.

Liess A., LeGros A., Wagenhoff A., Townsend C.R. & Matthaei C.D. (2012) Anthropogenic nutrient enrichment in streams: consequences for periphyton nutrient content and invertebrate community composition. Freshwater Science, in press (published online 10 July 2012).

Lill, A.W.T., Closs, G.P., Savage, C. and Schallenberg, M. (2012) Annual secondary production of two estuarine mysid species (Mysidacea: Mysidae) inhabiting an intermittently closed estuary, south-eastern New Zealand. *Marine and Freshwater Research* 63:823-834.

Lill, A.W.T., Closs, G.P., Schallenberg, M., and Savage, C. 2012. Impact of Berm Breaching on Hyperbenthic Macroinvertebrate Communities in Intermittently Closed Estuaries. *Estuaries and Coasts* 35:155-168.

Vanderpham, J.P., Nakagawa, S., and Closs, G.P. (2012) Diel variation in use of cover and feeding activity of a benthic freshwater fish in response to olfactory cues of a diurnal predator. *Environmental Biology of Fishes* 93:547-556.

Wagenhoff, A., Townsend, C.R. & Matthaei, C.D. (2012) Macroinvertebrate responses along broad stressor gradients of deposited fine sediment and dissolved nutrients: a stream mesocosm experiment. Journal of Applied Ecology, (published online 5 July 2012).

2011

Dolédec, S., Phillips, N. & Townsend, C.R. (2011) Invertebrate community responses to land use at a broad spatial scale: trait and taxonomic measures compared in New Zealand rivers. Freshwater Biology 56: 1670-1688.

Effenberger M., Gerth M., Diehl S. & Matthaei C.D. (2011) Experimental bed disturbance and fish exclusion influence the distribution of stream invertebrates and algae. Journal of Animal Ecology 80: 603-614.

Jenkins, K.M., Kingsford, R.T., Closs, G.P., Wolfenden, B.J., Matthaei, C.D., and Hay, S.E. 2011. Climate change and freshwater ecosystems in Oceania: An assessment of vulnerability and adaptation opportunities. *Pacific Conservation Biology* 17:201-219.

Lill, A.W.T., Closs, G.P., Savage, C., and Schallenberg, M. 2011. Annual secondary production of two estuarine mysid species (Mysidacea: Mysidae) inhabiting an intermittently closed estuary, south-eastern New Zealand. *Marine and Freshwater Research* 62:823-834

Kristensen, E.A., Closs, G.P., Olley, R., Kim, J., Reid, M., and Stirling, C. 2011. Determining the spatial distribution of spawning by anadromous and resident brown trout *Salmo trutta* L using strontium content of eggs collected from redds. *Ecology of Freshwater Fish* 20:377-383.

Lange K., Liess A., Piggott J.J., Townsend C.R. & Matthaei C.D. (2011) Light, nutrients and grazing interact to determine stream diatom community composition and functional group structure. Freshwater Biology 56: 264-278.

Olley, R., Young, R.G., Closs, G.P., Kristensen, E.A., Bickel, T.O., Deans, N.A., Davey, L.N., and Eggins, S.M. 2011. Recruitment sources of brown trout identified by otolith trace element signatures. *New Zealand Journal of Marine and Freshwater Research* 45:395-411.

Reid D.J., Hewitt J.E., Scarsbrook M.R., Thrush S.F., van Houte-Howes K.S.S., Lohrer, A.M., Wright-Stow A.E., Chiaroni L.D., Matthaei C.D., Smith B.J., Townsend C.R. & Phillips N.R. (2011) Comparison of sedimentation impacts on the benthos of streams and estuaries using simultaneous field experiments. Marine and Freshwater Research 62: 1201-1213.

Wagenhoff A., Townsend C.R., Phillips N. & Matthaei C.D. (2011) Subsidy-stress and multiple stressor effects along gradients of deposited fine sediment and dissolved nutrients in a regional set of streams and rivers. Freshwater Biology 56: 1916-1936.

MURRAY DARLING WETLANDS LTD

Sarah Ning took up a position as Project Officer in mid-August and is based in Albury. She will be working on the Murray Wetland Carbon Storage project, in partnership with the NSW Murray Catchment Management Authority. Sarah previously worked at the North East CMA in Wodonga, which followed her honours work on 'Seed bank viability of floodplain wetlands – Lake Hume to Barmah' with Drs **Roger Croome** and **Daryl Nielsen**.

The Murray Wetland Carbon Storage project will revegetate and rehabilitate wetlands on private property in the Murray catchment through an on-ground incentive program, increasing their capacity to store carbon for the long-term. Wetlands will be protected and enhanced through a range of differing methods including: biodiverse plantings; grazing management; pest and weed control; and environmental water delivery. The first phase of the project will rehabilitate 400 ha of Murray catchment wetlands over two years, building capacity of regional communities to manage wetlands and build resilience to climate change in priority landscapes.

Deb Nias has commenced working on a partnership project with Lower Murray Darling CMA to investigate future options for potential water regimes and management of Bottle Bend.

Rhonda Sinclair is also working on a partnership project with Lower Murray Darling CMA to investigate engineering options of the Carrs, Cappitts and Bunberoo Creeks system to improve water management for environmental purposes.

The 20th anniversary of the NSW Murray Wetlands Working Group was the perfect opportunity for committee members, past and present employees, friends and associates of the group to get together and share the stories of what has made and still makes the group special. The anniversary was celebrated at Wonga Wetlands, near Albury, on 26 April with an evening meal and a glass or two. Some of the attendees shared their experiences and will available to read on the new look MDW Ltd website, to be launched after the AGM in late October.

We have also released a video on YouTube where some of the landholders we have worked with over the years talk about environmental flows and what it has meant to them [youtube.com/user/murraydarlingwetland]. Thanks to film maker, Tyler Freeman Smith from Free Range Multimedia, and the Murray-Darling Basin Authority, for assistance with funding.

Rhonda Sinclair (r.sinclair@westnet.com.au)

ECO LOGICAL AUSTRALIA (ELA)

The ELA Aquatic Team have had a busy quarter, with projects in many parts of NSW and Queensland.

Nathalie van der Veer has been sorting through macroinvertebrate and riparian health data for the Border Rivers-Gwydir catchments. Nathalie, **Rebecca McCue** and **Damien Smith** had a very busy time earlier in the year sampling 60 sites throughout the catchments to assess the success of rehabilitation work for the Border Rivers-Gwydir CMA.

Peter Hancock has continued his surveys of the Hunter Valley stygofauna, which first began in 2000. Recent surveys have turned up some range extensions for blind dytiscids and elmids in the Hunter aquifers. Nathalie, Rebecca and **Dan McKenzie** have also been involved in stygofauna surveys in the Hunter and Namoi alluvial aquifers.

Peter and Becky recently completed a fish, invertebrate, water rat, and microbat survey of the Little Llangothlin Nature Reserve near Glen Innes. Field work involved some very early starts in the chilly Tableland winter, where ice still fringed the lagoon in the early afternoon.

ELA welcomes two new staff members to the aquatic team. **Katrina Cousins** joined ELA in May, and after a charity bike ride in the Pyrenees in June has settled into the Brisbane office. Katrina has a strong background in a range of aquatic ecology disciplines and has worked in most states of Australia.

Dr Julie-Anne Harty is our other recent recruit. Julie-Anne joined the Newcastle office and comes with extensive experience with environmental flow plans and river and floodplain management in the Murray-Darling Basin.

Nathan Kearnes, Paul Frazier and the **GIS team** have recently completed a large remote sensing project across a vast portion of central southern Queensland to identify and map new spring locations (vents, complexes and watercourse springs). This project will inform field validation and characterisation of the springs as well as provide baseline information to guide assessments, planning and management.
Ian Dixon has been busy relocating native fish and turtles from dam to dam in Western Sydney. Lots of writing dewatering plans and wrestling eels as the old farm dams get taken over by new suburbs. Ian has also been advising on some dam restoration projects to make them more fish-friendly.

Peter Hancock, peterh@ecoaus.com.au

THOMPSON LAB

SCHOOL OF BIOLOGICAL SCIENCES, MONASH UNIVERSITY

It's not strictly freshwater, but congratulations to **Giselle Perdomo** (effects of climate change and habitat fragmentation on moss-microarthropod food webs) for completing her PhD (co-supervised by **Ross Thompson** and **Paul Sunnucks**). Giselle has returned to Venezuela to take up a position with the Ministry for the Environment. At the other end of things... welcome to **Nicholas Moran** who for his PhD will be working with **Ross Thompson** and behavioural ecologist **Bob Wong** on community composition of arid zone fishes.

Things are ticking along in the lab, with **Phil de Zylva** (who completed a Hons with Ross and **Jenny Davis** last year) joining us again to work on environmental flows monitoring in the Goulburn. **Jim Griffiths** (also ex-Hons) has also joined us to man the microscopes on invertebrate samples from central Australia. **Adrian Dusting** is continuing his PhD work on invasion and adaptation in New Zealand mudsnails (co-supervised by Ross Thompson and Paul Sunnucks), and is learning the joys of sequencing. **Clarissa Barbosa** is up to her neck in zooplankton and invert samples from both central Australia and her major experiment. **Mel Klamt** (Thompson/Davis) is staring down the barrel of her PhD confirmation for her project on the ecological role of platypus in running waters. **Glenis McBurnie** of the NT government is working for her Honours degree with Ross and Jenny on waterhole communities... the project involves paddling pools, camel dung and a lot of frustration!! **Teresa MacIntosh** (PhD; biodiversity of urban wetlands; Thompson/Davis) has finished her first full field season and is learning the joys of picking wetland bug samples. **Darren Gilling** (PhD; carbon dynamics in streams subject to revegetation; co-supervised by Ross and **Ralph Mac Nally**) has just returned from a very fruitful trip to ESA in Portland Oregon. **Cassie Mealey** is in the writing up phase of her Hons on potential bio-controls for Gambusia.

Ross, **Mike Grace**, **John Beardall** (algal physiology) and **Jason Beringer** (climate modelling) are in the final phases of their *NCCARF* funded project looking at climate effects on ecosystem processes, working with **Paula Sardinia** as a post-doctoral fellow. Ross has just commenced his *ARC Future Fellowship* for four years – largely based around a project exploring food web assembly and its interactions with anthropogenic change.

Sally Hladyz is continuing to lead Monash's involvement, with Jenny Davis and Mike Grace, in the CSIRO Environmental Flows flagships based around work in the Edwards-Wakool system, in collaboration with **Robyn Watts** and **Keller Kopf** at Charles Sturt University.

And of course congratulations to **Sam Lake,** who recently celebrated his 71st birthday!!

Ross Thompson

ASL EXPERTS

The following ASL members have volunteered to speak as experts on the topics listed under their name. In doing so they speak on their own behalf, not on behalf of the ASL.

If you wish to be included on the list contact Dr R.Marchant at rmarch@museum.vic.gov.au

Prof A. Arthington: in stream flows, ecology of exotic fishes, conservation of rare fishes. Australian Rivers Institute, Griffith University, Nathan QLD 4111. Phone (07) 3875 7403, Fax (07) 3875 7615, email: a.arthington@mailbox.gu.edu.au

A/Prof P. Boon: bacteriological issues, wetlands. Environmental Management, Victoria University of Tech., PO Box 14428 MMC, VIC 3000. Phone (03) 9365 2214, Fax (03) 9365 2465, email: paul.boon@vu.edu.au

Dr K. Bowmer: pesticides - fate and ecological impact, aquatic plant management. Charles Sturt University, PO Box 588, Wagga Wagga, NSW 2678. Phone (02) 6933 2221, Fax (02) 6933 2060, email: kbowmer@csu.edu.au

Dr M. Brock: temporary wetlands, aquatic plants. 47 Brightwater Rd, Blackmans Bay, TAS 7052. Phone (03) 6227 1812, mobile 0429721416, email: brock.margaret@gmail.com

Prof. S. Bunn: stream ecology, ecology of riparian zones, biomonitoring. Australian Rivers Institute, Griffith University, Nathan, QLD 4111. Phone (07) 3735 7407, Fax (07) 3735 7615, email: s.bunn@griffith.edu.au

Dr M. Casanova: charophytes, temporary wetlands. 273 Casanova Rd Westmere, VIC 3351. Phone (03) 5350 2111, email: amcnova@netconnect.com.au

Prof J. Davis: wetland and stream ecology, ecology of central Australian waterbodies. Department of Biological Sciences, PO Box 18, Monash University, Clayton VIC 3800. Phone (03) 9905 1063, email: Jennifer.Davis@sci.monash.edu.au

Prof. P. De Deckker: salt lakes: biology, chemistry and history; palaeolimnology towards understanding past environmental change. Dept. of Earth & Marine Sciences, The Australian National University, Canberra ACT 0200. Phone (02) 6125 2070, Fax (02) 6125 5544, email: patrick.dedeckker@anu.edu.au

Dr. M. Douglas: tropical freshwater ecology, intermittent streams, tropical floodplains. School of Biological and Environmental Sciences, Northern

Territory University, Darwin, NT 0909. Phone (08) 8946 7261, Fax (08) 8946 6847, email: michael.douglas@ntu.edu.au

Dr S. Eberhard: groundwater dependent ecosystems (subterranean fauna), caves and karst. Subterranean Ecology, Scientific Environmental Services, Greenwood, WA. Phone (08) 9203 9551

Dr M. Finlayson: wetland ecology and management; mining and agriculture impacts; inventory and assessment, Ramsar convention. Institute of Land, Water and Society, Charles Sturt University, Albury NSW. Phone (02) 6051 9779, email: mfinlayson@csu.edu.au

Dr A. García: taxonomy, ecology, biology and biogeography of extant and fossil charophytes. School of Earth and Environmental Sciences, University of Wollongong, NSW 2522. Phone (02) 4221 5966, Fax (02) 4221 5703, email: adriana@uow.edu.au

A/Prof M. Grace: nutrient cycling and biogeochemical processes. Chemistry Department, Monash University,Clayton, VIC 3800. Phone (03) 9905 4078, Fax (03) 9905 4196, email: michael.grace@sci.monash.edu

Dr T. Grant: platypus biology. Biological Science, University of NSW, PO Box 502, Cronulla, NSW 2230. Phone (02) 9527 2862, Fax (02) 9527 2862, email: t.grant@unsw.edu.au

A/ Prof M. Greenway: Constructed wetlands, Melaleuca wetlands, biogeochemical processes. School of Environmental Engineering, Faculty of Environmental Engineering, Griffith University, Nathan QLD 4111. Phone (07) 3875 7486, Fax (07) 3875 7404, email: m.greenway@mailbox.gu.edu.au

K. Hortle: Fisheries and environment, impact of mining, impact of development in SE Asia and PNG on rivers. 23A Waters Grove, Heathmont VIC 3135. Phone (03) 9720 5891, email: kent_hortle@bigpond.com

A/Prof P. Horwitz: conservation of freshwater invertebrates. Centre for Ecosystem Management, Edith Cowan University, Joondalup Drive, Joondalup, WA 6027. Phone (08) 9400 5558, Fax (08) 9400 5070, email: phorwitz@cowan.edu.au

Prof. P.S. Lake: stream ecology, conservation freshwater biota. Department of Biological Sciences, PO Box 18, Monash University, Clayton, VIC 3800. Phone (03) 9905 5653, Fax (03) 9905 5613, email: sam.lake@sci.monash.edu.au

Dr C. McCullough: mine water remediation and management, mining pit lakes, acid mine drainage, acid sulfate soils, ecotoxicology. Edith Cowan University, 270 Joondalup Drive, Joondalup WA 6027. Phone (08) 6304 5143, email: c.mccullough@ecu.edu.au

Dr V. Matveev: plankton food webs, biomanipulation. CSIRO Land and Water, 80 Meiers Road, Indooroopilly, QLD 4068. Phone (07) 3214 2755, Fax (07) 3214 2881, email: vlad.matveev@csiro.au

K. Muller: constructed wetlands, wetlands of the lower Murray. River Murray Catchment Water Management Board, 1 Colman Tce, Strathalbyn SA 5255. Phone (08) 8536 8125, Fax (08) 8536 8126, email: kerri_muller@triplei.com.au

Dr R. Pearson: tropical freshwater ecology. School of Tropical Biology, James Cook, University, Townsville, QLD 4811. Phone (07) 4781 5466, Fax (07) 4781 5511, email: richard.pearson@jcu.edu.au

Dr P. Pollard: microbial ecology. Australian Rivers Institute, Griffith University, Nathan QLD 4111 Phone (07) 3875 6597, Fax (07) 3875 7404, email: p.pollard@griffith.edu.au, web: www.microbialecology.org

Dr W. Ponder: taxonomy, biogeography and biology of freshwater mollusca. Invertebrate Zoology, Australian Museum, 6 College St, Sydney NSW 2001. Phone (02) 9320 6120, Fax (02) 9320 6050, email: winstonp@amsg.austmus.gov.au

Dr M. Serena: platypus ecology and conservation. Australian Platypus Conservancy, PO Box 84, Whittlesea VIC 3757. Phone (03) 9716 1626, Fax (03) 9716 1664, email: platypus@vicnet.net.au

Dr B. Sherman: reservoir management, cold water pollution and algal blooms. CSIRO Land & Water, Water Quality and Environmental Flows, GPO Box 1666 Canberra ACT 2601. Phone (02) 6246 5579, email: brad.sherman@csiro.au

Dr R. Thompson: food web ecology, stream and lake ecology, climate change effects on aquatic habitats. Australian Centre for Biodiversity, School of Biological Sciences, Monash University, Clayton VIC 3800. Email: ross.thompson@monash.edu

Dr B. Timms: lake geomorphology, coastal dune lakes, arid zone wetlands. Australian Wetlands and Rivers Centre, BEES, University of NSW, Sydney NSW 2052. Email: brian.timms@unsw.edu.au

Dr L. Townley: groundwater-surface water interactions. Townley & Associates Pty Ltd, PO Box 425, Claremont WA 6010. Phone (08) 9389 6377, Fax (08) 9389 6477, email: LTownley@Townley.com.au

ASL SUBS

I would encourage all ASL members to visit: www.asl.org.au and if necessary bring your account up to date and make any changes necessary to your details.

To attend the conference at member rates you must be a financial member valid until June 2013.

If your current membership expired June 2012, you can either renew online or when you register for the conference your membership will be automatically renewed until 2013.

If you think your membership has expired or you need confirmation of your status, please contact Heather Proud at ASN Events or phone 03 59 832 400.

Please note, if you do not wish to pay with your credit card online, you can print the form and send a cheque or money order to ASN Events.

ASN Events Pty Ltd
Box 200, Balnarring
Victoria, Australia, 3926
Telephone: +61 (0) 3 5983 2400
Fax: +61 (0) 3 5983 2223

MEMBERSHIP RATES 2011/12

Ordinary Membership with email copy of newsletter: $ 75.00 (incl.GST)
Ordinary Membership with hard copy of newsletter $ 97.00 (incl.GST)
Student Membership with email copy of newsletter: $ 35.00 (incl.GST)
Student Membership with hard copy of newsletter: $ 57.00 (incl.GST)
Ten Year Membership with email copy of newsletter $675.00 (incl.GST)
Ten Year Membership with hard copy of newsletter $873.00 (incl.GST

.....CUT HERE

Method of Payment: Cheque ( ) Money Order ( ) Credit Card ( )
Please Debit my:
Bankcard ( ) Visa card ( ) MasterCard ( )
Card number _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
Amount $..... Expiry Date .....
Name of card holder
.....
Signature
.....

REGIONAL EXECUTIVE MEMBERS 2012

WA
Joanne O'Connor, Murdoch University, South St. Murdoch. Perth WA 6150, Phone (08) 9360 6079, email: j.o'connor@murdoch.edu.au

NT
Erica Garcia, Office: Red 1, Level 3, Research Institute for Environment and Livelihoods, Charles Darwin University, Darwin, NT, Phone (08) 8946 7445, email: erica.garcia@cdu.edu.au

NSW
Eren Turak, Research scientist, Office of Environment and Heritage, Australian Museum (NSW), email: Eren.Turak@environment.nsw.gov.au

QLD
Dr Samantha Capon, Australian Rivers Institute, Griffith University, Phone (07) 3735 3914, email: s.capon@griffith.edu.au

SA
Dr Kane Aldridge, Ecology Evolution and Landscape Science, Adelaide University, Phone (08) 8303 3747, email: kane.aldridge@adelaide.edu.au

VIC
Assoc. Prof. Barbara Downes, School of Anthropology, Geography and Environmental Studies, The University of Melbourne, Parkville VIC 3010, Phone (03) 8344 6781, Fax (03) 8344 4972, email: barbarad@unimelb.edu.au

TAS
Dr Scott Hardie, Department of Primary Industries, Parks, Water and Environment, 13 St Johns Avenue, New Town, TAS 7008, Phone (03) 6233 6713; email: Scott.Hardie@dpipwe.tas.gov.au

ACT
Dr Evan Harrison, Institute for Applied Ecology, University of Canberra, ACT 2601, Phone (02) 6201 2080, email: Evan.Harrison@canberra.edu.au

ASL Newsletter
http://www.asl.org.au/

If undelivered please return to:
ASL Inc,
c/- ASN Events,
PO Box 200,
Balnarring VIC 3926
AUSTRALIA

HAVE WE GOT YOUR DETAILS RIGHT?

To change your mailing details, please complete the below form and return to the address above:

MRS/DR/MR/PROF/MS/OTHER:.....
FIRST NAME:.....
SURNAME:.....
POSITION:.....
COMPANY:.....
NEW ADDRESS:.....
SUBURB:.....STATE:.....
P/CODE:.....
PHONE: WORK ( ).....FAX (....).....
EMAIL:.....